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MISSOURI BOTANICAL GARDEN BULLETIN

Volumes 52 - 53 1964 - 1965

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MISSOURI BOTANICAL GARDEN

Bulletin

January 1964
Volume LII
Number 1

COVER: Kenneth Peck demonstrates a grass snake to an interested audience during the Pitzman Summer Nature Program.

PHOTO BY ARTHUR FILLMORE

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden. 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LII No. 1 January 1964

CANDELABRA, *(CASSIA ALATA)*

Early last autumn one of the active members of the Horticultural Society brought to the Garden for identification the leaf of an interesting subtropical shrub. She had received it last spring from a friend of hers in Louisiana under the name of "Candelabra" as a small plant a few inches high and had set it out in her rose garden. It flourished in the summer heat and by early September was over waist high and growing actively.

It proved to be a tropical shrub, *Cassia alata,* which we have grown and flowered in the Climatron. It is so widespread in the tropics that botanists are not certain of its original home. Its common name in the Philippines is "Akapulko" which would most probably indicate that it arrived there in early Spanish times by way of Acapulco, Mexico, and may be a New World species. It is now common in many parts of the Philippines (as elsewhere in the tropics) both as an ornamental and a drug plant. There it grows into a shrub eight feet high with arrestingly unusual foliage and tight spikes of yellow flowers. (This dual career of drug plant and ornamental is found in at least one other Cassia. The beautiful "Golden-Shower Tree" is the source of the cassia pods of the drug trade.) *Cassia alata* as a drug has been used for various purposes but particularly with skin diseases; its common English name in parts of the tropics is "Ringworm Bush." In other areas its beauty has won out and it is known as "Seven Golden Candlesticks," of which "Candelabra" is an obvious condensation.

The plain green leaves of a young plant of *Cassia alata* are a dramatic sight; they can be up to three feet long but are usually much shorter. They are made up of pairs of leaflets set opposite each other, the terminal pair being wider and rounder than the rest. The others are so straight and so parallel-sided and so square-cornered that they look almost artificial. The severity is relieved by a shallow notch at the tip of each leaflet with a minute hook set within it. A larger hook of the same sort is set at the top of the rachis between the terminal leaflets. At the base of each leaflet, which is set up tight against the rachis, is a swollen, amber-colored area. It is the site of an organ, the pulvinus, which controls the movements of the leaflets;

they fold up at night just as do clovers and most other legumes.

Thrifty young plants of candelabra are worth growing in St. Louis in the summer time just for the interest and beauty of their unusual leaves. They are available in Florida and Louisiana along with many other subtropical ornamentals. Some of these, the lantanas, for instance, have now become so common that we take them for granted as part of our summer gardening picture. With the new types of houses that many of us live in, with increasing numbers of people who are driving back North each spring, with the increase in amateur greenhouses, we need to be more aware of what the subtropics has to offer for our gardens.

With the warm weather of October and November this plant of "Seven Golden Candelsticks" flourished amazingly and flowered on several of its branches. As in the Climatron, the bright yellow blossoms were packed so closely together that they looked (to quote the lady who raised them) "like a wand of yellow rosebuds." With the continuing warm weather, and the protection from the earliest frosts which we get within the Metropolitan area they stayed in flower for some time and were beautiful and interesting in the garden.

While we cannot expect to have warm Octobers and Novembers in every year, neither need we expect such cool weather as we had this year in June and July. For the gardener with a little sporting blood here is something to try out in a sunny corner but one protected from early frosts.

E.A.

* * *

ROBERT EVERARD WOODSON, Jr.

1904–1963

Dr. Woodson, the Garden's Senior Taxonomist and Professor in the Henry Shaw School of Botany at Washington University, died on November sixth after suffering a severe heart attack and being hospitalized for a very few days. It was forty years ago this autumn that as a brilliant undergraduate student at Washington University he first began to visit the library, the herbarium, and laboratories, and the greenhouses at the Garden. By the time he graduated in 1926 he was one of a group of outstanding young people (including Mildred Mathias, now Professor of Botany at U.C.L.A.) who were carrying on advanced work here.

As a native St. Louisan, born of a southern family with distinguished connections in Kentucky and Virginia, he all his life had deep-seated loyalties to Missouri and St. Louis. It was not easy to persuade him to take part of his training elsewhere. When, reluctantly, he spent one of his graduate years at Harvard, he returned however with new enthusiasms. He had not only taken full time work at the Gray Herbarium; he had also studied with Professor E. C. Jeffrey who had induced in him a deep, and continuing, interest in plant anatomy, the study of fossil plants, and problems of evolution.

For his doctorate he worked out the classification of Apocynum, the genus to which belong the Dogbane and the Indian Hemp. It was no ordinary monograph but attempted to determine not only what the species were but how they had evolved and were evolving. He had studied them widely in the field as well as in the herbarium and had interesting and original theories. Five years later he helped me test some of these ideas experimentally in the breeding plot. So far as they went these data supported his interpretation.

Immediately after receiving his doctorate in 1929 he accepted joint appointments at the Missouri Botanical Garden and Washington University. In his early years he carried on a variety of teaching assignments. He initiated advanced work in Plant Anatomy and so developed these interests that they culminated in the intensive studies of fossil plants by Dr. Henry Andrews and his students.

For a number of years he taught the beginning course in Elementary Botany. He took a deep interest in his students and sponsored voluntary field trips to which he devoted much time and energy. For hundreds of students this kindled an interest in the out-of-doors that will stay with them the rest of their lives. He attracted a number of able students into permanent careers in Biology, men who had already begun to specialize in other fields: Russell Seibert, now Director of the Longwood Gardens; David Waugh, the Biophysicist; and Professor Charles Heiser of Indiana University. He joined Dr. Karl Sax and me in a joint investigation of the American Tradescantias in the field, the herbarium, and the cytology laboratory, one of the first of such joint studies.

Meanwhile his program at the Botanical Garden was developing. He went on from Apocynum to monograph other genera in that family and in the closely related Milkweed family. Here he was a scholar's scholar, dealing with some of the most complicated flowers in the plant kingdom, apparently a whole special chapter in evolution which had not been looked into so deeply before. One small segment of this work brought him public recognition. Among the genera which he had monographed for the New World was Rauwolfia. When the world's first tranquilizing drug was recognized in an Indian species of this genus, his detailed understanding of the species became of theoretical and commercial importance. Under his leadership a monograph of Rauwolfia was brought out in 1957 which dealt with its Botany, Pharmacognosy, Pharmacology, and Chemistry.

He became Curator of the Herbarium in 1948. For the rest of his life he had to live day by day and year after year with the increasingly frustrating problems of finding support for the proper development of a great herbarium.

Early in his work at the Garden he became interested in the flora of Panama and for several summers studied and collected there with some of his students. This led to his initiating an illustrated flora of the country, a project in which he was joined by scholars throughout the world and which is still going forward.

In the 1940's Dr. Woodson branched out into a detailed study of the dynamics of evolution in one species of milkweed, the Butterfly Weed, *Asclepias tuberosa.* He studied it in detail, using refined statistical methods, in the herbarium, the breeding plot, the laboratory, and in the field all the way from the Rockies to the Atlantic Coast. He measured the extent to which the sub-species in the central part of the continent was mixing with those from the Coastal Plain. In 1960, fourteen years after he had taken large field samples all the way from Kansas to Norfolk, Virginia, he went back to the same areas and with his new samples demonstrated the consistent differences which had accumulated in that interval.

These data are among the most impressive which had ever been collected in a direct study of Natural Selection in the field. While in general they are in accord with modern theories of evolution, they present features which cannot yet be satisfactorily accounted for on any theory. William Bateson, one of the founders of Genetics, said that scientists should "treasure their exceptions." It is among those scientists who have gone most deeply into the details of his work that there is a growing conviction that here is something important. It has already caused some serious rethinking by experts in this field. Out of it may stem further advances.

EDGAR ANDERSON

NEW HOURS FOR THE CLIMATRON

THE Climatron is open every day of the year (except New Year's Day and Christmas Day). On weekdays it is open from 9:00 A. M. to 5:00 P. M. Week-ends and holidays the hours are as follows:

NOVEMBER through MARCH

SUNDAYS from 9:00 A. M. to 9:00 P. M.

APRIL through OCTOBER

SATURDAYS and SUNDAYS from 9:00 A. M. to 9:00 P. M.

HOLIDAYS from 9:00 A. M. to 9:00 P. M.

Memorial Day, May 30th
Independence Day, July 4th
Labor Day, September 7th
Thanksgiving Day, November 26th

Effective as of January 1st, 1964.

EDUCATIONAL PROGRAMS 1964

ACTIVITIES FOR CHILDREN

SATURDAY NATURE PROGRAMS FOR CHILDREN

NATURE study programs are provided every Saturday morning from 10 to 11:30 A. M. in the Museum Building and greenhouses for children ages 7 to 16. The programs are free and no advance registration is required.

Children are given instruction in the world of plants and their associations with man, animals, birds and insects. They are encouraged to make collections. They plant seeds and bulbs and make cuttings of plants. These programs offer children action, recreation, and the fun of taking home their collections, seedlings and bulbs.

For more information, call TO 5-0440.

PITZMAN SUMMER NATURE STUDY COURSES

A free summer nature program for children between the ages of 7 and 16 is made possible by a grant from the Pitzman Foundation. Children have a fundamental curiosity about everything going on around them, and these summer courses encourage this interest in living things by bringing children into closer contact with nature and answering the many questions that arise from such an experience.

The program is held on 4 days a week, with Tuesday-Thursday and Wednesday-Friday sections, from 10 A. M. to 3 P. M. each day for two 5-week sessions. Children register for either the Tuesday-Thursday or Wednesday-Friday section.

Registration for the first session will begin June 1st and for the second session July 1st. For information about the courses and registration, visit the Main Gate Office or telephone TO 5-0440.

COURSES FOR ADULTS IN HOME GARDENING

The Garden offers courses in gardening for all interested persons. Fees charged for the adult courses include all materials. Most classes and practice sessions will be held in the Garden's Experimental Greenhouse, which can be reached by entering the Cleveland and Tower Grove Avenue gate.

Registration for all courses must be made in advance, since the number of persons who can be accepted for a given course is limited. Should interest warrant, second sessions will be considered and should less than fifteen persons register for any course, it may be dropped, in which case the fees will be refunded.

All courses will be taught by Garden staff members and by selected specialists. Fees are based on the amount of time and materials supplied by the Garden.

HOW TO PROPAGATE FROM SEED

Fundamental facts and procedures for producing annuals, biennials and some perennials from seed for use in your garden. The Garden supplies seed, germinating media and soil for four metal flats of seedlings which may be taken home. Persons wishing to supply their own seed must bring it to the first session.

5 Sessions — Fee $12.00	**Experimental Greenhouse**
Tuesday afternoons — 1 to 2:30 P. M.	**March 17, 24, April 7, 14, 21**
Thursday evenings — 8 to 9:30 P. M.	**March 19, 26, April 9, 16, 23**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

HOME ORCHID CULTURE

Orchids suitable for home culture and best ways of growing them. Potting demonstrations and practice. Students may take home the plant they pot.

1 Session — Fee $10.00	**Orchid Greenhouse**
Saturday — 10 A. M. to 3 P. M.	**April 4**

Instructor: Mr. Robert J. Gillespie

PREPARATION AND CARE OF LAWNS

Instruction on kinds of grasses and weeds and how to identify and control them. Preparation of ground for lawn establishment, soil conditioning, fertilizers and their application, rebuilding old lawns, maintenance and equipment will be discussed. Special attention will be given to individual problems.

3 Sessions — Fee $6.00	**Museum Building**
Tuesday evenings — 7 to 9 P. M.	**August 11, 18, 25**
Instructor: Mr. Raymond Freeborg	

PLANTS UNDER ARTIFICIAL LIGHT

Latest up to date thoughts and practices on the use of artificial light for plant propagation and culture, illustrated with practical equipment for the amateur or professional grower.

1 Session — Fee $5.00	**Orchid Greenhouse**
Saturday — 10 A. M. to 3 P. M.	**October 10**
Instructor: Mr. Robert J. Gillespie	

HOW TO PROPAGATE FROM CUTTINGS

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings (asexual reproduction). The Garden will supply a plastic covered metal propagating flat, media and plant materials for 40 to 50 kinds of plants. Student practice will emphasize propagation of house plants such as begonias, dieffenbachias, and philodendrons. Some attention will also be given to hardwood cuttings. The following methods of vegetative propagation will be used: root cuttings, suckers, divisions, hard and softwood stem divisions, hard and softwood stem cuttings, leaf, bud and scale cuttings.

5 Sessions — Fee $12.00	**Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M.	**October 13, 20, 27, November 3, 10**
Thursday afternoons — 1 to 2:30 P. M.	**October 15, 22, 29, November 5, 12**
Instructors: Mr. Clarence Barbre Mr. Kenneth Peck	

GUIDED TOURS

Organized groups and classes can obtain trained guides for visits to the Garden by telephoning TO 5-0440 at least ten days before their visit. Adults in tours, other than teachers with their classes, are expected to pay the usual admission charge to the Climatron, but there is no charge for children or teachers with class groups.

SELF GUIDING TOURS

Climatron — An instructive pamphlet is available at the Climatron.

Tree Trail — An illustrated guide sheet to forty trees is available free at the Main Gate Office.

PROGRAM OF SATURDAY ACTIVITIES FOR 1964

JANUARY

4 "Dead or Alive." A field study of plants in winter.
11 "Winter Puzzles." Children will identify trees in winter by their twigs.
18 "Jungle Plants." A short trip through Climatron to learn about and view jungle plants.
25 "Table Top Greenhouses." Propagate plants from cuttings. (Bring a 1 ℔ coffee container and plastic bag large enough to cover.)

FEBRUARY

1 "Life Secret of a Plant." Microscopes will be used to view plant cells.
8 "How Cells Multiply in Plants and Animals." Research microscopes will be used.
15 "Mystery of the Orchid." Why is it different from all other flowers?
22 "Nature Movies." Three color-sound nature movie films.
29 "Pin Cushion Forests." Life story of mosses. Take home labeled specimens.

MARCH

7 "The Story of Ferns." Comparison of ferns to mosses and flowering plants. Press fern leaves to take home.
14 "Plants in a Capsule." Seed structure and how they are formed. Take home seeds.
21 "Miniature Gardens." Plant little gardens to take home. (Bring rigid container, maximum size 12″ × 12″ × 4″ deep.)
28 "Sowing Seeds." Learn to sow seeds. (Bring 1 ℔ coffee container.)

APRIL

4 "Rise of Forests." Plant succession or how forests come into being.
11 "Flower Shapes and Names." How to identify spring wild flowers.
18 "Nature Films." New color-sound movie films on a spring theme.
25 "Transplanting Seedlings." Transplant and take home plants for a small garden. (Bring a 1 ℔ coffee container.)

MAY

2 "Woodlands of America." Study of major forests of Missouri and eastern United States.
9 "Plants with Wet Feet." Demonstration of aquatic plants. See them in underwater tunnel in Climatron.
16 "Prehistoric Plants." The story of fossil plants.
23 "From Dust to Seed." Flower pollination and development of fruits and seeds.
30 "Bees and Flowers." Observation of bees seeking nectar in flowers.

JUNE

6 "Tags for Trees." Make plaster casts of leaves to learn their structure.
13 "The Queen of Flowers." Sample and study the fruits of members of Rose family.
20 "Nature Hunt." A treasure hunt for leaves and seeds. Prizes awarded.
27 "Nature Films." A selection of the newest and best color-sound films.

JULY

4 Holiday. (No program will be held.)
11 "The Bread-Winning Family." Collect and mount grasses to take home.
18 "Dangerous Plants." Learn to identify poison ivy and other poisonous plants.
25 "Formulas for Flowers." Find new way to look at flowers and mount several to take home.

AUGUST

1 "New Generation." Collect seeds. Prizes awarded to collectors of greatest number.
8 "Uses of Wild Plants." Learn way to use wild plants as source of water, food and dye.
15 "Table Top Greenhouses." Propagate plants from cuttings. (Bring 1 ℔ coffee container and plastic bag large enough to cover.)
22 "Late Summer Landscapes." Draw or paint landscapes.
29 "How to Make a Terrarium." Small plants and soil for terrarium supplied by Garden. (Bring a wide mouth jar or small glass bowl.)

SEPTEMBER

5 "The Mighty Oaks." Make collections of important species to take home.
12 "The Hundred-in-One Flower." Study early fall flowers belonging to Sunflower family.
19 "Devil's Footstools." Mushroom demonstration including story of penicillin.
26 "Plants with Split Personalities." Story of plants known as Lichens. Take home samples.

OCTOBER

3 "Planting Bulbs." Paperwhite narcissus bulbs planted to take home. (Bring a 1 ℔ coffee container.)
10 "Fall Treasure Hunt." Field trip in Garden. Contest and prizes for solving riddles and trail finding.
17 "Fall Colors." Draw or paint scenes in Fall color.
24 "The Forests of the Rocky Mountains." A travelogue illustrated with slides.
31 "Nature Movies." Three color-sound movie films.

NOVEMBER

7 "Bird Feeders." Make a simple bird feeder to take home. (Bring an empty half-gallon milk carton.)
14 "Soil and Water Conservation." A study of soils and erosion, watersheds and forests, the dangers of water pollution.
21 "Fun with Fruit." Learn to identify variety of fruits. Prizes awarded.
28 "Deserts." The deserts of North America and how plants live in them.

DECEMBER

5 "Insectivorous Plants." Demonstration and description of weird plants that digest insects.
12 "Christmas Decorations." Make decorations from seeds, seed pods, cones, etc., to take home.
19 "Christmas Wreaths." Make a Christmas wreath to take home. (Bring a wire coat-hanger.)
26 "Nature Films." A selection of the newest and best color-sound films.

DROUGHT — PHILOSOPHICALLY

LOUIS G. BRENNER

The drought of the fall of 1963 will not be easily forgotten by those who find pleasure in the outdoors. It is indeed disheartening to see the Missouri landscape sear and gaunt at a season normally so full of the expectancies of riotous fall color. It is more than a little disturbing to hear the dry harsh rattle of leaves on the forest floor when migrating warblers should search through leafy forest canopies for insects.

Asters that normally winked at us with clear blue or mauve eyes from sunny coppice borders were hardly to be recognized with buds blasted on December-like stalks. Thus deprived of some of the sensual pleasures of late September and October countryside many of us have speculated in climatic alteration by the atomic devices or even wrath evoked by divine power upon man. But cyclic drought has been an important feature of mid-western and Missouri climatic pattern for centuries past and through it we find part of the reason why Missouri looks like "Missouri" with its prairie areas, rocky glades, cedar barrens, oak–hickory ridge forests, white oak–sugar maple forest on lower slopes, and flood plain forests all represented as rather well defined habitats. Recurrent drought has effected natural selection among native plants developing a flora peculiarly able to withstand such trying conditions. Availability of water together with temperature and the quality of the soil largely determine the divisions between the major habitats in our mid-western area.

Because soil lying undisturbed exhibits little change even over long periods of time it remains then for climatic features, rainfall and temperature, to exact controlling limitations upon the habitat. Within the past year we have been able to witness an excellent example of the dual interaction of both climatic variables in an extremely cold winter and a severe autumn drought. Such conditions are wondrously designed to maintain the identity and purity of the habitat. Effects of the past drought season have been most pronounced in upland habitats as prairie, limestone glade, oak–hickory and white oak–sugar maple. If the naturalist looks about him next spring he will note that most of the trees and plants showing signs of distress are of species not normally considered components of that immediate habitat.

Trees have greater demands for water hence exhibit more dramatic effects of drought. Trees such as elm and sycamore have light winged seeds that are blown great distances by wind. During moist years seeds of such trees germinate and develop in almost any habitat where small patches of bare ground with sufficient light are available. They then continue to grow as long as there is sufficient moisture to support growth. It remains then for seasons of drought to remove such species from the upland habitats and restrict them to flood plain and lowland woods habitats of which we consider them important elements. Naturalists should learn to look upon drought as a sort of natural predator designed to weed out the habitat and maintain its identity as an association of plant species naturally selected to endure all normal climatic extremes on that site.

The most recent drought along with the announcement by the weather bureau that we are now, over the past ten year period, behind in rainfall almost the equivalent of an entire year of normal precipitation should point out the urgency of water conservation if we are to preserve our woodland habitats. Land owners, even those of very small acreages, can do much to aid in this problem and in a most enjoyable fashion. The method is simple. All dead tree limbs and logs are arranged on the hillside in a horizontal or level position so that in effect they act as small dams retarding the flow of runoff water following heavy rains. This permits more water to soak into the soil and about the tree roots. Limbs and logs lying in this position and close to the ground also hold dead leaves in place to decay into forest compost. Soon the limbs and logs also decay because of closer proximity to the moisture from the soil. If preferred, small dead trees up to 8 or 10 inch diameters may be felled with axe or power saw. All brush and logs from such downed trees is also disposed by arrangement on the contour (in level position of the slope. *Do not cut dead trees more than 10 inches in diameter—save them for den trees in your woods.*

A serious mistake among land owners engaged in such a program is the attempt to "clean up" their woods by removing underbrush and lower growing limbs. Such material plays a most important role in buffering winds and if removed permits the winds to move freely and in doing so hasten the drying of the woods. The above maintenance program makes a wonderful chore for pleasant brisk winter days. It's a vigorous chore indeed; rest breaks are in order. While you relax into cozy pungency of a leafy drift take a minute to explore the wonders of mosses, lichens and fungi with a small pocket hand lens. While you're at it notice the differences in the buds on dormant twigs, the odors and grains of the different woods.

After several years of practicing such a maintenance program there will be a difference about your woods. Most noticeable will be the greater depth of woods soil or duff. Wildflowers will increase; indeed species not growing on your property in years past will appear as if by magic.

While the effects of the past drought became most dramatic in late September and October the signs of distress in plants became evident as early as mid-August. Nearly all species of late summer and early fall grasses and weedy plants that provide the bulk of winter food for sparrow and finch-like birds have been restricted in seed production. Food sources for these birds are at a very low level now with a long winter season still ahead. All persons are urged to fill the hoppers of the feeder early and keep them full. Add plenty of millet and small grass-like seed; chances are with the scarcity of these foods in weedy lots you may be able to enjoy experiences with species of sparrows not commonly attending your feeding area.

(Reprinted from Saint Louis Audubon Bulletin, November 1963.)

* * *

AUTUMN COLOR IN 1963

In spite of more or less continuous drought throughout the growing season which brought real damage to some of the Garden's trees, the mid-October to mid-November display of autumnal color was as outstanding as any in recent years. The deep, intense reds were muted or lacking altogether but the bright yellows more than made up for the difference. Sweet Gums which have been deep crimson in other autumns were a mixture of strange pinkish reds. Others were yellow with splashes of light red. One Gum tree was all in shades of yellow with no red at all. Even the Amur Maples at the rear of Tower Grove, always one of the brightest of our fall displays, were in lavender reds rather than flaming crimsons. The Virginia Creeper along the fence behind the Cleveland Gate House which in other years has been an almost fire-cracker red was a pale green with subtle pink shadings.

Autumn leaves with abundant red color have been found to be rich in sugars. With this year's poor growing conditions there was probably less sugar in the leaves. Then too, like much of the Metropolitan Area, the Garden missed the first hard frost; our trees passed on into the Indian Summer weeks which followed with their leaves quite undamaged but their gears shifted, so to speak, by their various reactions to the cooler nights. The leaves ripened slowly. The sugars had time to drain away. The yellow pigments of late autumn developed almost as they do in Italy.

Hard frost held off until the end of the third week in November. By that time the latest of our Ginkgoes to color had slowly turned from green to green-gold and green-gold to yellow. The oldest of these trees are towering and leafy. When the sunlight hits them at the height of their color a golden radiance, strong enough to cast a shadow, is reflected into the shade under other trees and through the windows of nearby buildings.

E.A.

FLOWER SHOW SCHEDULE FOR 1964

Jan. 12	Last Sunday of 1963 Poinsettia Show
Jan. 19–Feb. 2	Primroses
Feb. 6	Orchid Show Preview
Feb. 9–23	Orchid Show
March 1–15	Tulip Show
March 21–22	African Violet Show
March 29	Easter Show
April 5–26	Spring Flower Show
May 2–10	Lady Washington Geraniums
May 16–17	St. Louis Horticultural Society's Spring Show
May 23–24	Rose Show
June	Hydrangeas
June 27	Hemerocallis Show
July–August	Foliage Plants
July 18–19	Illinois Gladiolus Society Show
Sept. 5–13	Henry Shaw Cactus Society Show
Sept. 19–20	Harvest Show of the Regional Council of Men's Garden Clubs
Sept. 26–27–28	Dahlia Show
Oct. 17–18	Allied Florists
Oct. 29	Chrysanthemum Show Preview
Nov. 1–29	Chrysanthemum Show
Dec. 6–Jan. 10	Poinsettia Show

NEW MEMBERS OF THE FRIENDS OF THE GARDEN

November 1 through December 5

Miss Melba E. Aufderheide
Mr. and Mrs. Dudley B. Batchelor
Miss Bess Belzer
Mr. and Mrs. Edward X. Boeschenstein
Mr. Adolph Burmeister
Esther Carlson
Mrs. Grace H. Coleman
Miss Ruth D. Colestock
Mr. and Mrs. Paul Ira Cook
Mr. and Mrs. James T. Dodds, Jr.
Mr. and Mrs. Aaron T. Ferris
Miss V. Feurbacher
Mrs. Ben L. Goldberg
Hanley Woods Garden Club
Mr. Louis H. Heger
Mr. and Mrs. Ralph Hermon
Miss T. Louise Kelley
Dr. and Mrs. F. T. Kraus
Miss Edna Landzettel
Mr. and Mrs. Howard H. McGee
Miss Erma Maurer
Mr. and Mrs. Charles J. Morse
Mr. Howard Ohlendorf
Mrs. Herbert L. Parker, Jr.
Mr. Clif Placke
Miss Alice Rice
Miss Ellen A. Schlafly
Mr. and Mrs. Roger D. Smith
Virginia C. Sodemann
Mr. and Mrs. Meade Summers
John B. Sutphin, M.D.
Mr. and Mrs. Charles A. Sutton
Mrs. Wilford H. Taylor
Mrs. William C. Valli
Miss Aurelia M. Voelker
Mr. and Mrs. Maurice R. Wheeler

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HORTICULTURAL COUNCIL

Paul M. Bernard, Mrs. Paul H. Britt, E. G. Cherbonnier, Philip A. Conrath, Carl F. Giebel, Paul Hale, Earl Hath, Mrs. Hazel L. Knapp, F. R. McMath, Dan O'Gorman, Gilbert Pennewill, Ralph Rabenau, Mrs. Gilbert J. Samuelson, Robert E. Goetz, *Chairman*.

WOMEN'S ASSOCIATION

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HISTORICAL COMMITTEE

Leicester B. Faust, *Chairman*, Mrs. Edwin R. Culver and Mrs. Neal S. Wood, *Co-Chairmen for Restoration*

GARDEN STAFF

Hugh C. Cutler, Executive Director
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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres is open every day of the year except Christmas and New Year's from 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 9:00 P. M. and on Saturdays, April through October, as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

February 1964
Volume LII
Number 2

Cover: Limestone bluffs at Pine Hills north of Wolf Lake, Illinois. Though too rugged to explore easily there is a large number of species of plants to be found within a short distance of this point. Photo by Evers. (We are indebted to Dr. Robert Evers and the Illinois Natural History Survey for the illustrations used in this number of the Bulletin).

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For The Naturalist, Places And Plants In Illinois

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: Edgar Anderson

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Volume LII No. 2 Bulletin February 1964

FOR THE NATURALIST, PLACES AND PLANTS IN ILLINOIS

Most St. Louis naturalists when planning a week-end in the country instinctively think of some place in Missouri. After all, the Ozark Plateau begins at the edge of our metropolitan area and continues all the way to northern Arkansas. Not all of it is picturesque when seen from the highway but many of the side roads look inviting and we are conscious of being in the kind of landscape that may give our minds and spirits something to feed upon. Most of Illinois, when we drive through it, is now little more than farmlands where the prairies used to be, alternating endlessly with cutover woodlands along muddy rivers.

A few of us gradually learn that at various places in the state of Illinois (some of them quite close to St. Louis) there are areas quite as interesting to naturalists, amateur or professional as those in our own state. Yet even after our attention has been turned in that direction it takes lots of asking around and much consulting of maps before we find the kinds of places we are looking for.

In July of 1963 an official document was published which will help in finding our way. It is a detailed survey of the twenty-four places in the state of Illinois most likely to meet such needs. It was prepared by Dr. Robert A. Evers, Associate Botanist, Illinois Natural History Survey. It was titled "Some Unusual Natural Areas in Illinois and a Few of their Plants" and is Biological Notes no. 50 of the Natural History Survey Division (Urbana, Illinois) of the Department of Registration and Education for the State of Illinois.

Dr. Ever's survey is an attractive brochure of 32 big (8.5" x 11") pages. In addition to a front cover view taken along the Cache River there are 42 photo-engravings in black and white and a map of Illinois showing the location of the twenty-four "Natural Areas". The back cover is taken up both inside and outside with a roster (citing both common and scientific names) of the native plants mentioned in the text, from the Bird's eye Primroses in the north to the Silverbell Tree in the south.

"In 1959, six Natural History Survey staff members (William E. Clark, Robert A. Evers, R. Weldon Larimore, Milton W. Sanderson, Philip W. Smith, and Lewis J. Stannard) who were interested in natural areas in Illinois, where they were located, and what was unique about them, became greatly concerned about our loss of scientifically important places. They suggested approximately 70 localities and from these selected 23 that they believed to be the most unusual. Most of the 23 localities are among the 24 natural areas described in this article. The others are of importance, and doubtless there are many more areas within the state that are worthy of preservation. Many of the state parks have been omitted, not because they lack natural areas but because they have been described elsewhere."

Now that the prairies have disappeared the few broken fragments of them which persist here and there along roadways or railroad rights-of-way are precious. It is imperative that the best of these be located, be reserved as areas of national importance and somehow be protected as much as possible against herbicides. The most important prairie remnants discovered by the Survey were along the Illinois Central Railroad in the central part of the state, east and a little north of St. Louis. Evers describes the main sequences in their summer displays of wildflowers and shrubs:

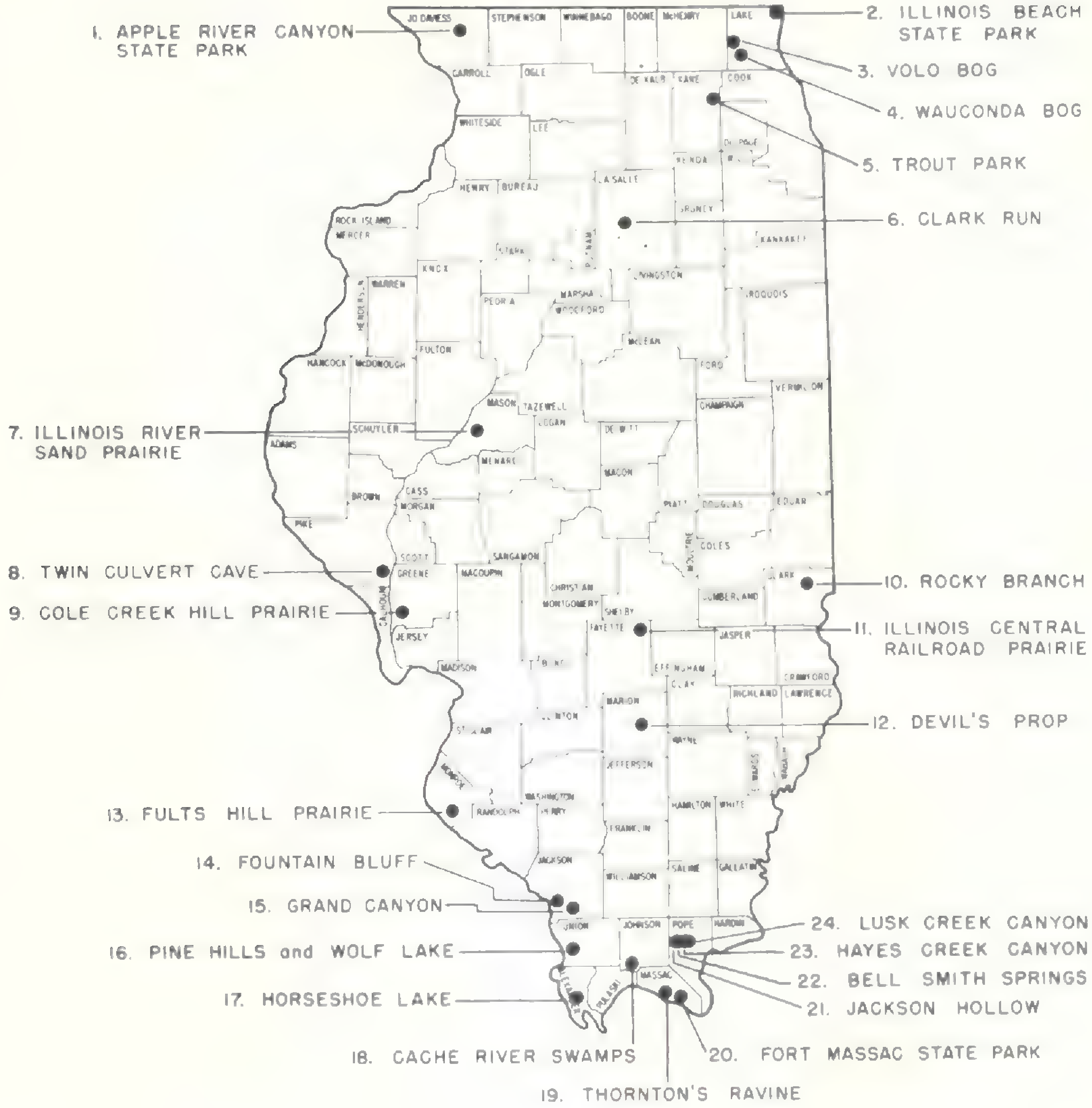
AN ILLINOIS CENTRAL RAILROAD PRAIRIE

"A little over a century ago, much of east-central Illinois was flatland prairie. Although early settlers shunned the land as being unsuitable for cultivation because of a belief that only forest soils were fertile, later ones found it was extremely productive and valued it highly. After a suitable plow had been perfected to break and turn the prairie sod and after drain tile had been placed to lower the water level, vast stretches of prairie were converted to farmland. Now only remnants of prairie are left; they are along roadsides or railroad trackways. These remnants must be preserved if we wish any Illinois flatland prairie vegetation to remain for future generations to study and enjoy.

"A prairie area located along the trackway of the Illinois Central Railroad between Laclede, Fayette County, and Alma, Marion County, is actually a series of remnants of the Twelve-Mile Prairie of south-central Illinois. Numerous stretches of this trackway have been plowed for production of farm crops or of nursery stock. Some stretches that were cultivated have been abandoned and have reverted to a prairie type of vegetation.

"The plants of the area are typically those of the tall grass prairie. Big bluestem is the usual dominant, although switchgrass and Indian grass are locally abundant and occasionally dominant. In the wettest parts of the prairie, prairie cordgrass is the dominant plant and densely covers the ground. In places of little disturbance, the prairie is a patchwork of a few species covering the sizeable areas. In some sites, big bluestem covers much ground, while a short distance away may be blazing stars, rosinweed, prairie-dock, compass plant, wild hyacinth, or one of the numerous goldenrods, as *Solidago rigida.* Shrubs in the prairie include New Jersey tea and lead plant.

"The seasonal aspect of the prairie is interesting to observe. In early spring the prairie is dormant and shows little activity until May, ex-


1. APPLE RIVER CANYON STATE PARK
2. ILLINOIS BEACH STATE PARK
3. VOLO BOG
4. WAUCONDA BOG
5. TROUT PARK
6. CLARK RUN
7. ILLINOIS RIVER SAND PRAIRIE
8. TWIN CULVERT CAVE
9. COLE CREEK HILL PRAIRIE
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20. FORT MASSAC STATE PARK
21. JACKSON HOLLOW
22. BELL SMITH SPRINGS
23. HAYES CREEK CANYON
24. LUSK CREEK CANYON

A county map of the state of Illinois showing the location of the 24 "Natural Areas" considered by Dr. Evers. (Courtesy, Illinois Natural History Survey).

cept for the flowering of a few cruciferous weeds, including Whitlow's grass. Some of the early flowers are small and rather inconspicuous, as blue-eyed grass, or small and conspicuous, as puccoon. The large and showy flowers of the beard-tongues appear in late May. In June the lead plant and the purple coneflower give a purple cast to the landscape. From then to the frosts of autumn a gradual but continual change of blossoms occurs, with the purple being replaced by yellow as the dominant color. Goldenrods and asters bloom profusely toward the close of the growing season.

"Unfortunately, many people incorrectly believe the coarse prairie plants to be undesirable weeds. Within undisturbed prairie remnants very few, if any, noxious weeds—the type that cause the farmer trouble—can be found. Only after the prairie has been plowed or tremendously disturbed do the noxious weeds obtain a foothold. They then remain long after the land is no longer cultivated and they even thrive in the secondary prairie type that develops.

"This prairie area between Laclede and Alma is owned by the Illinois Central Railroad. Efforts have been made by the Nature Conservancy to obtain a long-term lease for stretches, about 12 miles, of these remnants of the once vast flatland prairie."

FOUNTAIN BLUFF

One of the strangest landscapes near St. Louis is Fountain Bluff where the Mississippi River changed its course. In doing so it left behind in the bottomland a small fragment of the old upland, four miles long and nearly half as wide, rising dramatically out of the floodplain right next to the Mississippi River. Its summit, which once bore an observation tower, is over 400 feet above the river and the bottomland. Evers gives a little of its geology and its recent history. I wish he had given more; it is a peculiar and interesting place, but one difficult to find your way around in:

"Fountain Bluff is 4 miles long and 1.8 miles across at the widest point; it has a perimeter of slightly more than 10 miles. Limestone of the Chester series, which scarcely outcrops at the south end of this outlier, is overlain with Caseyville sandstone. This massive sandstone forms the spectacular cliffs of Fountain Bluff. In a number of places the sandstone has been eroded to form large ravines or small valleys, some of which have been named. Loess caps the sandstone. The highest elevation on Fountain Bluff is 779 feet above sea level or 419 feet above the floor of the valley to the east and about 430 feet above the Mississippi River to the west.

"Approximately a dozen farm homes are located at the base of the cliffs and in the largest ravine, known as Happy Hollow. A road follows the creek through Happy Hollow for a mile before it ascends to the top of the ridge on the west and then trends about a mile northeastward to the point of highest elevation, the site of Fountain Bluff Lookout Tower, a structure removed before 1950. On the east side of Fountain Bluff, three cemeteries, Goodbread, Henson, and Hudson, occupy small areas. A railroad, a branch of the Illinois Central from Carbondale to Gale, skirts the base of Fountain Bluff on the north and west. Years ago a station, Fountain Bluff Station, stood at the mouth of a beautiful ravine on the northwest side of the bluff. Later a dam was constructed across this ravine, near its mouth, to impound water for a swimming pool. Both station and pool have disappeared. The pool was filled by silt carried in by running water. The silt now supports semiaquatic and mesic plants.

"On the west side of Fountain Bluff is another large ravine, Trestle Hollow. On the southwest, not on the bluff but on the riverbank and adjacent bottomland, several industries—a grain loading dock, a sand gravel company, and a power station—have developed. Three power lines from the power station cross Fountain Bluff. Two extend eastward; the third stretches northward for some distance on the crest of the bluff ridge along the Mississippi River.

A slender Plume Grass, *Erianthus alopecurioides,* rare so far north, on the top of Fountain Bluff. Note the pines in the background. Photo by W. D. Zehr.

"The vegetational cover of Fountain Bluff is mostly deciduous forest; it is interspersed with small prairie openings and one large hill prairie. A small area serves as agricultural land for crop and livestock production and as a site for a commercial enterprise. The dominant tree of the forest appears to be the tulip tree. This tree grows on the slopes and in the ravines. Associated with this species is northern red oak, black oak, white oak, chinquapin oak, and white ash. In the valleys or ravines the sycamore, beech, honey locust, hard maple, and American and slippery elms grow profusely. Black locust evidently was once widely planted in the area. The understory trees include sassafras, redbud, flowering dogwood, hop hornbeam, Iowa crabapple, and blue beech. Common shrubs and vines are poison ivy, spicebush, wild hydrangea, and the introduced Japanese honeysuckle. In some places, this honeysuckle has become a pest; it covers the ground surface, forms a dense growth on tree trunks, and completely covers small shrubs. Many ferns and herbaceous flowering plants, including rare orchids, grow in the moist ravines. Mosses are ordinarily common on the soil surface, and both mosses and liverworts abound on the moist sandstone outcrops and cliffs in the ravines. Of interest to botanists are the numerous patches of plume grass that are scattered on the ridge top to the north and at the base of the bluff to the east. This grass may reach heights of 8 feet or more.

"The prairie openings are small and most of them are on the ridge tops. The one sizable hill prairie of this area is situated on the southwest-facing ravine slope at the northern end of Fountain Bluff. The dominant grass of the prairie types is little bluestem; big bluestem and Indian grass are not uncommon."

GRAND CANYON

Site No. 15 includes accessible and interesting samples of forest which are more like the rich woodlands of the Southeast with beech and tulip tree in abundance.

"Grand Canyon natural area, located about 8 miles southwest of Murphysboro, Jackson County, occupies the southeast quarter of section 35 and the southwest quarter of section 36, T.9S., R.3W., the west half of section 1, and much of section 2, T.10S., R.3W.; it is more than 700 acres in extent. The names Chalk Bluff, Hickory Ridge, and Viney Ridge are applied to the area or to parts of it.

"This natural area is a part of the bluff system of the Mississippi River valley. From the floodplain the bluffs rise precipitously 360 feet, reaching an altitude of 720 feet above sea level. The tall, west-facing cliff in section 2 is about 0.75 mile in length and is named Chalk Bluff. The cliff is plainly visible from Fountain Bluff, 4 miles to the west, and from other points in the river valley. Above the tall cliff lies a stony slope; loess caps the bluff.

"To the north of Chalk Bluff is a large valley, not quite 0.25 mile across, that is tributary to the Mississippi. This tributary valley, known

A ravine opening at the north-west edge of Fountain Bluff. There was once a railroad station near this point and the ravine was damned to make a pool. This is now silted up but it is moist enough to attract species of plants which would not otherwise be present. Photo by W. D. Zehr.

as Grand Canyon, has steep walls and cliffs. To the south of Chalk Bluff is Clear Creek. This stream flows in a rather broad valley approximately 0.5 mile wide and enters the Big Muddy River, which here flows southward through the Mississippi River floodplain. From Grand Canyon, sizeable ravines trend upslope to the south and from Clear Creek valley similar ravines trend upslope to the north to dissect the area into a series of deep ravines separated by ridges. The main ridge, which trends eastward from Chalk Bluff, almost midway between Grand Canyon and Clear Creek, is known as Viney Ridge. A half mile east of Chalk Bluff is Hickory Ridge. On this ridge the United States Forest Service has constructed a lookout tower. The elevation at this site is 740 feet; from the tower a view of the ridges and bottomland is obtained.

"The ridges support a mixed forest, including such species as chinquapin oak, northern red oak, black oak, sweet gum, bitternut hickory, tulip tree, and red cedar. Hop hornbeam, Hercules' club, and redbud grow as understory trees. Poison ivy, smooth sumac, and winged sumac are common shrubs. In some places two species of greenbrier form dense, almost impenetrable patches. Plume grass *(Erianthus alopecurioides)* grows profusely in some of the small openings of the ridge top and also on some slopes.

"The ravine slopes support a forest that includes some of the species enumerated above and also beech and tulip tree, which are very abundant. The understory includes flowering dogwood, papaw, and, along the rivulets, the blue beech. On these slopes the Christmas, the maidenhair, the broad beach, the glade, and other ferns are not uncommon. In spring, numerous wild flowers clothe the slopes.

"When I visited this area in 1949, a small hill prairie occupied part of the west-facing brow slope at the northern extremity of Chalk Bluff. Little bluestem was the dominant grass. Scattered throughout the prairie were small hickories, sassafras, and white oak.

"The bottomland forest beyond Chalk Bluff toward the Big Muddy River contains such species as overcup oak, swamp white oak, pin oak, pecan, and big shellbark hickory.

"Grand Canyon harbors some rare and semi-rare plant species: the clubmoss' *Lycopodium lucidulum,* which grows on a sandstone cliff of one of the tributary ravines; sphagnum moss, which covers a sizeable, moist sandstone outcrop in another ravine; and several orchids, including Wister's coralroot and twayblade.

"Much of Grand Canyon natural area is under the supervision of the United States Forest Service, but some parts remain in private ownership."

The next site chosen by Dr. Evers finds the Mississippi Valley bluffs closely adjacent to botanically interesting swamps:

PINE HILLS AND WOLF LAKE

"One of the most beautiful localities in Illinois is Pine Hills and the adjacent Wolf Lake and Larue swamps in Union County. No matter what the season is—winter, spring, summer, or autumn—this place abounds in natural beauty. It is located in sections 3, 4, 9, 10, 15, 16, 21, 22, 27, 28, 33 and 34, T.11S., R.3W., and sections 3 and 4, T.12S., R.3W. The hills extend 6 miles north from the village of Wolf Lake.

"The bluffs of the Mississippi River that form Pine Hills are underlain with cherty limestone that outcrops to form sizeable cliffs up to 100 feet high. Cherty slopes lie above the cliffs, and loess caps the bluffs. At the cliff bases, toe slopes of various sizes have been formed of rock fragments that have spalled from the cliff faces. The swamps are in the bottomland adjacent to the bluffs. They occupy the old channel of the Big Muddy River, which enters the Mississippi River valley west of Murphysboro, Jackson County, and meanders southward along the bluffs into section 4, T.11S., R.3W., then southwestward and westward to enter the Mississippi River below Grand Tower. In the earlier days, the Big Muddy continued its course southward along the bluffs. Present-day Otter Pond and Wolf Lake are parts of the old river channel. Big Muddy is an example of a Yazoo River type of tributary.

"The vegetation of Pine Hills is mostly deciduous forest. Prairie openings and one hill prairie are found here. The toe or talus slopes of the bluffs are forested, as are the ravines that extend eastward into the bluffs. The south-facing ravine slopes are covered with xeric oaks and hickories and some prairie herbs, the north-facing slopes with mesic forest, including tulip tree and hard maple. The cliffs support few plants except scattered individuals of cliff brake, some species of goldenrod, especially Drummond's, and red cedar.

"The brow slopes above the cliffs maintain forest in some places, prairie in others. Some of this prairie is of the typical hill type, with little bluestem the dominant grass, and some exists as small openings within the forest. The forest is a mixed deciduous type, with southern yellow pine and pink azalea as unusual species. Southern yellow pine is restricted in Illinois to two localities: Pine Hills and southern Randolph County to the north. Farkleberry is a common shrub on the Pine Hills slopes. These slopes are also the type locality of *Liatris scabra*, a species of blazing star that was first described from collections made here.

"The swamps are of interest botanically for the occurrence of several species that are rare in Illinois. Several species of duckweeds, including *Wolffiella floridana*, live in the water of this swamp, as do frogbit and swamp loosestrife, the last a species more common much farther north. Here can also be found the rare grass *Glyceria pallida*.

"Part of Pine Hills and the adjacent swamps is in the Shawnee National Forest, part in the Southern Illinois University Biological Station, and part in private ownership."

FORT MASSAC

Site No. 20 is largely of scenic and historic interest but includes big willow oaks, a magnificent southern oak which has now almost disappeared in Illinois:

"Fort Massac State Park is located along the north bank of the Ohio River, east of Metropolis, Massac County. Easily reached from highway US 45, the park occupies 840 acres of riverbank and bottomland woods. The locality was set aside as a state park because of its historical interest. It is the site of Fort Massac, also called Fort Cherokee.

"Perhaps the first biologist to visit Fort Massac was the French botanist Andre Michaux, who arrived on Thursday, October 8, 1795. He botanized in the area—in both Illinois and Kentucky—until November 6, when he returned to Kaskaskia. What Michaux saw and what the visitor today can see in the area are vastly different. The large bottomland forests and swamps have been cut and drained; only remnants remain. One of the trees of this bottomland is the willow oak. Its numbers have dwindled since the time of Michaux. Sizeable trees of this species once lined the highway south of Mermet. A few years ago, when this highway was being widened, the forest bordering the right-of-way was cut and these trees were destroyed. Several sizeable willow oak trees remain in Fort Massac State Park and thus are afforded some measure of protection. The number of willow oaks in the Black Bottom east of the park is decreasing. Soon persons looking for this plant in Illinois may be able to see it only at Fort Massac."

Our last selection from Dr. Evers' list is from one of the recreational areas provided by the U. S. Forest Service:

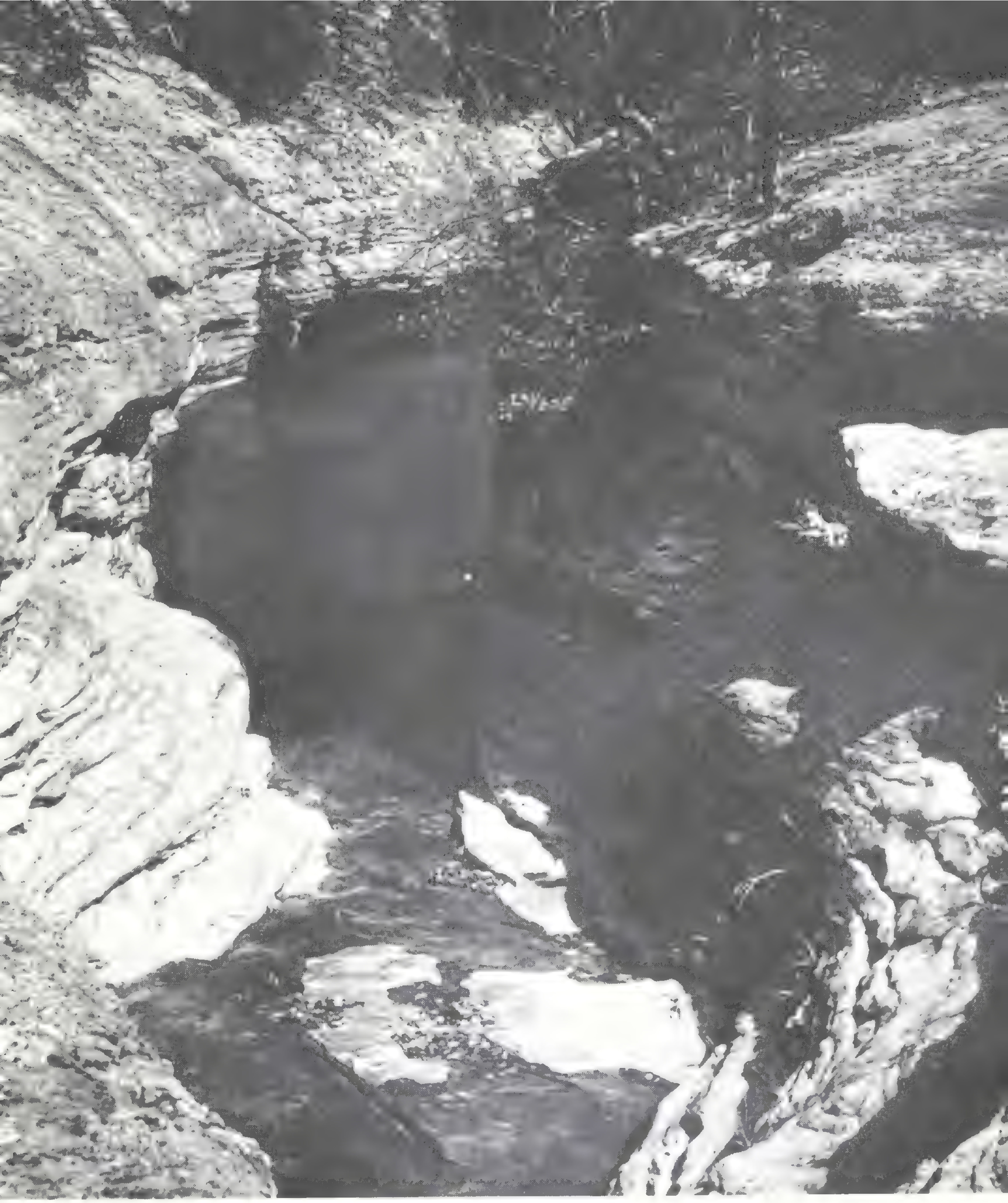
BELL SMITH SPRINGS

"Several miles east of Jackson Hollow is another of the numerous beauty spots of southern Illinois—Bell Smith Springs Recreational Area. It lies southeast of the community known as McCormick, in Pope County. Within the area, Spring Branch, Hunting Branch, and Hill Branch enter Bay Creek, which then flows southward. Most of the area is in sections 33 and 34, T.11S., R.5E.

"The huge cliffs and the small to massive blocks that strew the slopes between the cliffs and streams are sandstone. Cliffs have numerous undercuts, and a large natural bridge is developing along Bay Creek, north of Spring Branch. Many years ago, Hill Branch cut into the sandstone and at one place formed a sizeable gorge. Beyond the gorge, downstream, the bed of Hill Branch is strewn with rock fragments. The beds of Hunting and Spring branches are of similar aspect. In some places the streams are shallow and have riffles or small falls; in other places they are deep and form quiet pools. Visitors use some of the large, deep, quiet pools as swimming holes.

"The vegetation of Bell Smith Springs is deciduous forest, with prairie openings. Rock ledges and cliffs provide interesting plant habitats (Winterringer & Vestal 1956). A mesic forest, with beech and hard maple as the most common species, occupies the stream valleys. Above the cliffs several species of oaks and hickories replace the beech and maple. Along the stream banks the red maple, river birch, smooth alder, and Virginia willow thrive. Spicebush is a common shrub in the valley forest; farkleberry is common in the dry forests above the cliffs. Mosses, liverworts, and lichens clothe many of the moist, shaded overhangs. Some cliff faces lack plants and some support growths of lichens and a few ferns. A few hardy composites thrive in some of the cliff recesses. Some rock ledges are bare, but most are clothed with lichens and bryophytes. Vascular plants grow in crevices of the ledges or in the small pockets of soil that accumulate on the surface of the rock. In one overhang, the filmy fern grows in scattered patches.

"This area, under the control of the United States Forest Service, is used to some extent as a picnic area. The name is sometimes spelled "Belle Smith Spring" and for many years the name so spelled was carved on the Forest Service sign at the entrance. According to Allen (1949), the name should be Bell Smith."



A sandstone gorge at Bell Smith Springs near McCormick, Pope County, Illinois. One of the most beautiful areas in southern Illinois. Photo by Evers.

One cannot read this brochure carefully without being grateful for the efforts of the private citizens and state and national agencies which have made it possible for us to visit and enjoy these Natural Areas. At the same time there are disturbing references to the difficulties of maintaining them once they have been set up. At Apple River Canyon, "disturbance by visitors is present but not yet acute". At Illinois Beach on Lake Michigan the section designated as a nature area is threatened by "constant pressure to convert this delightful and restful part of the park to golf courses, picnic areas, playgrounds, and similar enterprises".

Particularly ominous are the recent changes at Trout Park on the bluffs of the Fox River at Elgin. Over thirty years ago it was set up in the words of its founders as something "more than a park; it is a preserve—a last refuge for the plant and animal life of an extensive region in these morainic hills of northern Illinois". Though owned by the City of Elgin it was "under the custody of those who so earnestly labored for its acquisition—the nature societies of Elgin". They laid down the rules which were carried out by the City. A portion of the Park is still in existence but Illinois Toll Road, Interstate 90, with a right-of-way of about 450 feet now passes through what was the largest and biologically richest ravine" in the park.

But for all that Dr. Evers closes his brochure with a hopeful note: "Although nonscientists may never carry out biological studies, the natural areas offer them opportunities to see bits of the forests and prairies for which Illinois was once famous and to observe the plants and animals, both common and rare, in some of these interesting habitats. It is in these places that they can relax and listen to the sounds of nature. ****** In our society, which requires a rapid pace but also provides much leisure time, these individuals deserve consideration * * * just as others have been provided with hunting, fishing, boating and playground areas. * * * Enjoy yourselves in these places. Help preserve them for future generations".

Edgar Anderson

* * *

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Edith S. Mason, Landscape Architect

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MISSOURI BOTANICAL GARDEN

Bulletin

March 1964
Volume LII
Number 3

COVER: Old bushes of Korean Boxwoods at the Main Gate of the Garden's Arboretum at Gray Summit, Missouri. These were grown from cuttings taken from the original plant sent by Ernest H. Wilson from the Arnold Arboretum in Boston over thirty-five years ago.

PHOTOGRAPH BY PAUL A. KOHL

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LII No. 3 March 1964

INTRODUCTION OF THE KOREAN BOX AT GRAY SUMMIT ARBORETUM

G. H. PRING

IN the spring of 1926 I invited my fellow Kewite, E. H. Wilson, Director of the Arnold Arboretum, Boston, Massachusetts, to be my guest speaker before the St. Louis Horticultural Society. I was delighted to receive his reply that he would be glad to address the Society, at which time it would give him an opportunity to visit the Garden and recently-purchased Arboretum. At that time the St. Louis Horticultural Society met at the Washington University Medical School Auditorium on Euclid Avenue. All horticultural and garden clubs were invited and needless to mention the auditorium was filled to capacity to hear of Mr. Wilson's many years of explorations in China and Korea. Next morning we went first to the Arboretum at Gray Summit accompanied by Gus Brooker. We had just finished grading the Pinetum, formation of the lake and planting of the perimeter with evergreens, the plants averaging from 3 to 4 ft. All the material which may be studied at the present time were raised from seed in the original nursery adjacent to the brick residence.

In discussing the future plantings with Wilson, the name "Pinetum" of course was used quite frequently. Said Mr. Brooker: "Wilson, you and Pring keep talking about the Pinetum. Why do you call it a Pinetum?" Wilson replied: "It is an area planted with pines." Jokingly said Brooker: "There are some Yews planted right in front of us. Why don't you call it a 'Yewetum'?"

Leaving the Pinetum, we went through the seed nursery, then over to the mansion to show Wilson the two 3 ft. specimens of European Box which were planted immediately outside the north entrance to the house. I gave him the history about the plants being brought into the St. Genevieve area by the French settlers. Four 3 ft. specimens were obtained, two of which were planted in the town Garden at the Main Gate, which did not survive the smoke and sulphur at that time. They were transplanted back in the nursery and the living material was used for propagation. Wilson said: "This is quite interesting, Pring, but I'm going to predict there is one Box which I collected in Korea in a location which has the two extremes in climate as you have here, which should grow very well here." I replied: "I would very much like to test your prediction. Will you send me a plant?" "Pring, I only have four plants in the Arnold Arboretum. If you were anyone else but a Kewite I would say no, but since I made the prediction, I will send you a plant which will be the first plant distributed from the Arboretum." Upon his return to Boston, he did send a plant which was about 1 ft. high. With the ensuing years I would take a few cuttings back to the Town Garden for Mr. Kohl to propagate. The original plant with the copper label attached may be seen outside the north window at the Main Entrance at Gray Summit. This parent plant, due to its many prunings for propagation, is not the same size in vigor as its offspring.

Excellent specimens are planted on the north side of the entrance building. The accompanying photograph will show plants that have grown together as one specimen. Mrs. Shepherd, one of the staff members from town, illustrates the size of the plant. These specimens have not shown any winter injury but the leaves lose their brilliant green color in winter. They change to a yellowish green. In March their green color will reappear. I noted that on plants in other locations in the Arboretum there was slight injury due to subzero weather.

Korean Boxwood has been used by Mr. Kohl in the Linnean Garden as an excellent border plant which is kept trimmed. The small Korean Box which Mr. Wilson sent made its debut in the west, so his prediction material-

A hedge of Korean Boxwood, kept low by shearing, planted around one of the small pools in front of the Linnean House.

PHOTOGRAPH BY PAUL A. KOHL

ized. Now it is distributed by all nurseries throughout the country. A recent visitor at the time of the Horticultural Congress was Dr. Donald Wyman from the Arnold Arboretum, who was extremely interested in this story. He commented on the excellent plants which we have just described.

A TREE ATTACKED BY DOGS

During the last few weeks one of the Florida corkwood trees *(Leitneria floridana)* between the Museum Building and Tower Grove Avenue has been repeatedly attacked by two black dogs (apparently retrievers) who visit the Garden frequently, always as a pair and always alone. The tree in question is part of a thicket of corkwoods, tall shrubs or small trees which serve to shield the Museum from the noise and dust of the nearby street. When the damage was first noticed it looked as if some children had been trying to break off one of the older corkwoods in the center of the thicket, a slender little tree with a basal diameter of about four inches. Evidence of renewed attack on the tree was noticed from time to time until finally one morning I surprised the two dogs actively working away tearing the tree to pieces. They were so intent on its destruction that they paid no attention to me as I stood at the edge of the thicket and watched what they were doing.

They were engaged in attempting to pull it up by the roots, to sever the main trunk, to pull and bite off the lower branches and to chew the base of the trunk to shreds. Since I scared them away they have evidently been back at work again for there are now large chewed shreds of the wood lying about the mangled stump.

No wood in the Garden's collections would be easier to chew than that of the corkwood, which is spongy and when dried lighter than cork itself. On the other hand the inner bark has a strong, unpleasant odor and a taste as bitter as quinine, to human beings at least. Yet the dogs were not chewing away at it contentedly as with a large bone. They were attacking it with gusto as if they got some special satisfaction out of the experience.

The corkwood is one of our rarest Missouri woody plants and so little is known about it that several years ago I used extensive indices now available in our Library and went through the world's botanical literature concerning it. Though there are some proven cases of particular plants with strong attractions for particular animals, nothing of this sort was mentioned in the various papers on the corkwood. They may have been chewing it just as puppies will chew many things around the house but they put great energy into it.

Edgar Anderson

NAMED VARIETIES OF AMERICAN HOLLY WHICH ARE OUTSTANDINGLY HARDY IN ST. LOUIS

The winter of 1962-63 was a testing time for hardiness all over the eastern United States (not to mention England and parts of Europe). In St. Louis many species and varieties of holly were badly damaged, some of which had been untouched in previous winters. For St. Louis gardeners the encouraging feature of the experience was that certain varieties (or at least certain trees and bushes) were undamaged.

Experience will certainly vary from gardener to gardener; winter hardiness is a problem with many facets; the immediate surroundings of a holly and the care it had last summer and autumn help to determine how it gets through a bad winter. Yet as this report will show, there are striking inherent differences in hardiness under St. Louis conditions, between named varieties now on the market.

We are hoping, therefore, that this will be the first among a series of reports from the St. Louis area. It concerns the garden of Mr. Edward G. Wood on the Kirkwood edge of what is now Crestwood, Missouri. Mr. Wood secializes in roses but has a choice collection of trees and shrubs and is a member of the American Holly Society.

Ilex opaca "CARDINAL" and *Ilex opaca* "MERRY CHRISTMAS" have been in the Wood garden for over 12 years. They had essentially the same treatment and both were good-sized fruiting specimens with full exposure to sun and wind. Neither had been injured before though *Ilex cornuta* had been hurt in recent severe winters.

CARDINAL was badly damaged in the Wood garden. The whole top of the tree was killed and lower branches were killed at the tips. After the injured portions were cut out it made a good recovery. MERRY CHRISTMAS on the contrary was not damaged. As usual it put out new foliage in the late spring and bore a heavy crop of berries in the fall of 1963. Incidentally this variety has held its fruit well every winter and into the following spring. In spite of the fact that the berries are harvested and used at Christmas, the tree being systematically pruned at that time, there is always fruit left on the tree. Every year in early spring a flock of migrating cedar waxwings arrives without warning and lives in the tree a day or so until the berries are all gone, then departs for another year.

A less conclusive test was from two varieties which had been in the Wood garden for a year. The variety CUMBERLAND was badly damaged; MAMIE EISENHOWER was not.

If you have had experience with named varieties of holly in St. Louis, will you share it with us? Either write me at the Missouri Botanical Garden, St. Louis (10), or call me at either TO 5-0440 or PR 2-0472.

EDGAR ANDERSON

"FAIR MAIDS OF FEBRUARY"

SOME common names have a life of their own and travel around the world independently of the plants they originally went with. "Cedar," as a word, came to us from the Bible, where it applies to the cedar of Lebanon. Yet the name cedar became part of our culture and wherever English-speaking people have lived for a time, some plant or other has had the name "cedar" grafted onto it. Usually it has stuck.

Another old English name which has strayed around in the United States is "Fair Maids of February." In an old garden in Mississippi it was applied to *Iris persica,* which makes low mats of bloom in mid-winter. From other southern gardens have come reports of still other sorts of "Fair Maids of February," but never with precise enough information to pin down the plant exactly, though enough to show that it was not the Persian iris.

In England the name is sometimes given as "February Fair Maids" and sometimes as "Fair Maids of February." There it is always applied to the common snowdrop and is so credited by the Oxford English Dictionary, which cites usages of it in that sense going back nearly two hundred years. It is still in use there for it was from twentieth century English books that I first ran across it. However, it can't be too common. February of 1930 I spent in Harpenden, which was then just at the very north edge of metropolitan London. I took long walks out into the countryside to the north and west and admired and photographed snowdrops without ever hearing this longer and more musical name.

From the Oxford English Dictionary I learned that the "Fair Maids" part of the title is associated with quite another plant. "Fair Maids of Kent" and "Fair Maids of France" are used to denote the *tall* double buttercup (the double form of *Ranunculus aconitifolius,* not the lower and spreading *R. repens* var. *pleniflorus* of so many St. Louis gardens).

In central Missouri the common snowdrop *(Galanthus nivalis)* seldom appears much before March and if it were not for the giant snowdrop *(Galanthus elwesii)* and its hybrids we should have no display in February. Yet part of the magic goes out of the name if you try to refer to snowdrops as "Fair Maids of March"!

With one good common name, we don't really need another. Yet snowdrops do make such a brave showing in spite of snow and ice, that it is pleasant to have this other name in reserve. It somehow seems to indicate extra appreciation for their bravery in flowering at such a time. The common snowdrop, and many varieties of the giants, do well in St. Louis once you have learned to give them plenty of leaf mold and partial shade, to transplant them only when they are in full bloom, and to keep them well away from walls.

EDGAR ANDERSON

KNOW YOUR GARDEN

THE OLD-FASHIONED FLOWER GARDEN AND THE NEW HERB GARDEN

THE area between TOWER GROVE, Mr. Shaw's old country residence, and his garden gate just behind it, is being transformed into a flowering terrace to accommodate these two choice gardens. The road which formerly cut up this plot was shifted just to the south, out of sight behind the remaining portion of the fence which bordered Mr. Shaw's kitchen garden. Money for constructing and planting the old-fashioned garden was raised by the Garden Club of St. Louis. The St. Louis Herb Society provided the funds for constructing the herb garden and will supply the actual plants and set them in place.

Redesigning the whole area and coordinating the two projects was in charge of Miss Edith Mason. Its basic lines are now those of a single brick-lined terrace. Yet each of the gardens is a unit in itself, distinctive in size, shape, and design, yet harmonizing with the other. The severity of the brick is relieved by a small turf walk near the center of the old-fashioned garden and by curving arcs of gray limestone chat which divide four of the beds in the herb garden.

The whole terrace is roughly one hundred feet long from east to west and about half as wide. It is attractively shaded by an old basal-branching magnolia at its southeast corner and by picturesque Amur maples grouped around the bay window of Mr. Shaw's study.

Since there was a good deal of rubble in the area, the beds were all dug out and refilled with rich soil which will have time to settle all winter and be ready for spring planting. This "garden front" has always been the most attractive side of TOWER GROVE. It now has a setting to show it off.

E.A.

PREPARATIONS FOR THROUGH THE GARDEN GATE, MAY 6 TO 9

THE "growing-greenhouses" at the Garden are filling up rapidly with plants being grown for the THROUGH THE GARDEN GATE sale and exposition to be held at Famous-Barr, Clayton, May 6, 7, 8, and 9. The making of the cuttings and the starting of the seeds has to be timed just right. Some of them develop faster than others. Getting them all at right condition for the sale is something like assembling and preparing all the materials for a banquet and having all the food done on time but not over-done. It is an even trickier job in the greenhouses than in the kitchen, for the hours of winter sunshine vary from year to year and the planning has to be kept flexible from start to finish.

Mr. Kohl and the men of his department have a great variety of bedding plants, annuals, and potted plants coming along with special emphasis on those which are proving widely adaptable under St. Louis conditions. This year, for instance, they are growing many more of the bedding begonias whose virtues are just beginning to be appreciated by many local gardeners.

Hanging baskets, having proved their worth in patio and porch gardening, are being prepared in quantity this year. Some of these feature the dwarf-branching ivy brought to the city several years ago by Mrs. W. Warren Kirkbride. Potted plants of this adaptable little ivy are also to be on sale, for given a protected site, it is remarkably hardy out-of-doors.

Tropical plants suitable for the sunporch, small greenhouse, and for patio gardening are the special concern of Mr. Lad Cutak and his group. Duplicate orchids from the Garden's collections will be on sale as well as water plants and other aquatics suitable for garden pools. A special feature this year will be brilliant new patented varieties of Bougainvillea ("TEMPLE FIRE," for instance) which have been developed for growing as dwarf, everblooming specimens in pots or tubs. Some of these are already developing buds, though still in small pots in the "growing-greenhouses."

With the cooperation of the St. Louis Herb Society, plants for herb and kitchen gardens are coming on, some of them destined for the new Herb Garden, others for sale at THROUGH THE GARDEN GATE.

⁂

A STRANGE USE FOR SWEET WOODRUFF

THROUGH one of the gardeners I learned of an interesting use for Sweet Woodruff, which every spring is in more demand in St. Louis for giving the distinctive flavor and a characteristic garnish to the traditional 'maybowl." He said that in parts of Germany it is dried and added to smoking tobacco.

⁂

THE Missouri Botanical Garden has just been accredited as a Public Rose Garden by the American Rose Society. This will entitle us to receive the All-American selections each year directly from the firms which are introducing them.

⁂

POPULAR BOOKS AT THE MAIN GATE INFORMATION CENTER

Dr. Julian Steyermark's new and monumental FLORA OF MISSOURI is now on sale at the information center at the Main Gate. It has black and white drawings of practically every species which is wild (or runs wild) in Missouri as well as diagrams showing county by county the distribution of each species within the state. It is selling well at the Main Gate at its listed price, $18.50. His deservedly popular SPRING FLORA OF MISSOURI was brought out as a reprint at the University of Missouri but this reprint is for the present not on the market. Though we have it on order, when we last inquired there was no immediate prospect of another printing.

Norman Taylor's ENCYCLOPEDIA OF GARDENING, which has successfully met the needs of many of the general public, formerly sold for $15.00. It has sold in such quantity that we are now able to offer the regular cloth-bound edition at $9.95.

Members of the Friends of the Garden are reminded that they can obtain these books through the Center at the usual reduction of ten percent.

NEW MEMBERS OF FRIENDS OF THE GARDEN

December 6, 1963, through February 7, 1964

Mr. and Mrs. Richard Amberg
Mr. Sam F. Barnett
Mr. Arthur M. Branch, Jr.
Mrs. Edna C. Branch
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Mrs. E. G. Burkham
Mr. and Mrs. E. Herbert Carlson
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Henry N. Andrews, Paleobotanist

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Paul A. Kohl, Floriculturist

F. R. McMath, Rosarian

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COVER: Sandstone cliffs along the lake made precarious walking and at one spot we were forced to wade the icy water for a half mile. Lake Hazen, Ellesmere Island.

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Book Reviews

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New Members of Friends of the Garden

Picnic for the Friends

A Good Early Crocus

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Vol. LII No. 4 April 1964

RETURN TO ELLESMERE LAND

HENRY N. ANDREWS

In collaboration with N. W. Radforth *and* T. L. Phillips

A YEAR ago we reported briefly on our paleobotanical explorations in the southwestern corner of Ellesmere Island in the summer of 1962. Although the fossil plants we collected have not been completely studied they were of sufficient interest to make us want to return and search in other parts of the island; since it is about 500 miles long and half as broad most of it is still unknown to the fossil plant hunter. Our return during the past summer was encouraged by aid from the Canadian government and we found ourselves in mid-July at the small camp that is maintained at Lake Hazen in the northeast corner of the island. Referring to the map on page 20 of the January, 1963, issue of the BULLETIN, our operations of last summer were about 400 miles northeast of Goose Fiord (at approximately 81° 45′ north).

Our interest in these two rather widely separated spots on Ellesmere originated from reports brought back by two classic Arctic expeditions. They may be mentioned briefly for the general importance they have in Canadian Arctic history and to answer, in part, the common question, "How do you know where to look for fossils?"

On the 24th of June, 1898, Otto Sverdrup sailed from Norway with a small group of explorers and scientists in Nansen's ship the "Fram." A fair share of his success should probably be given to this strange and rugged little boat that looks for all the world like a huge egg but with a "shell" that is a great deal tougher. After many years of faithful service in opening up the secrets of the Arctic the "Fram" rests today in its own museum in Oslo not far from two other museums, one of which houses some fine Viking ships of the distant past, and in the second is Thor Heyerdahl's "Kontiki" of more recent south Pacific fame.

For the next four years Sverdrup and his group explored the little known country that today constitutes the northernmost reaches of Canada. This is a region of islands and water and sea ice and the mixture of the three is not readily predictable. The mirages that can be seen looking out over the frozen sea may leave one greatly puzzled as to what is land and what is not land. In spite of airplanes (that do not always operate when one wants them most) and radios (that fade out at critical moments) it is still a remote land, but it was more remote in 1898. In attempting to push the "Fram" north along the west Ellesmere coast Sverdrup encountered adverse weather and sea ice and was forced to turn back and seek refuge in Goose Fiord during the winters of 1900–02. The geologist of the party, Per Schei, explored the neighboring country with considerable thoroughness and discovered in a band of rock several hundred feet above the fiord some fern-like plants known under the name of *Archaeopteris.* These have attracted considerable attention in more recent years as members of a group of plants that seem to be giving us significant clues to the origin of seed plants.

After locating the original spot from which Schei gathered about a ton of fossils we searched through the surrounding hills for the next month and found *Archaeopteris* at several other localities. With the specimens we

A typical bit of Lake Hazen scenery looking northwest from the camp toward the foothills of the United States Range.

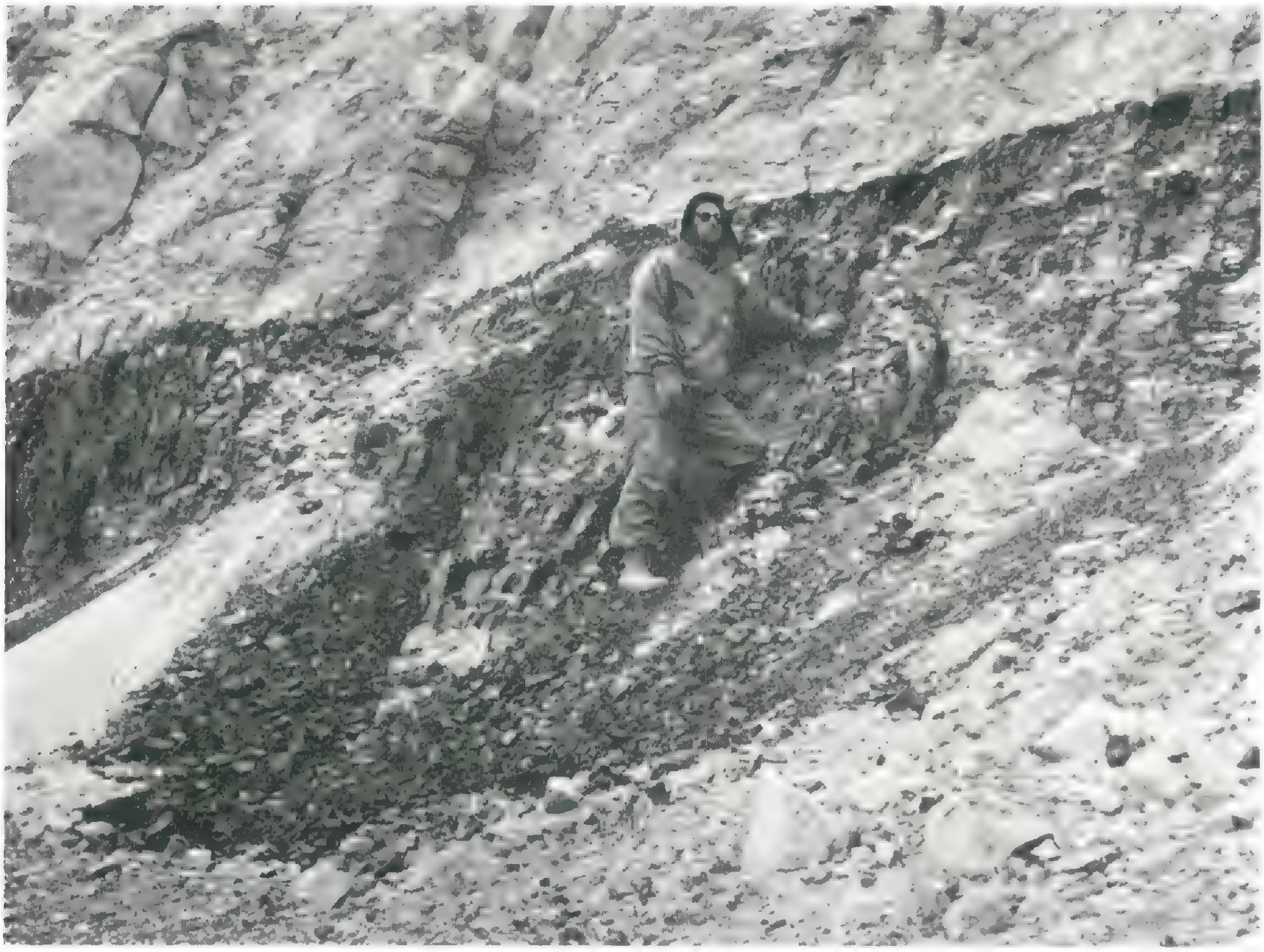
The Canadian Defense Research Board camp at Lake Hazen. Some of the tents are insulated and equipped for winter living.

found we are learning more about the spore-bearing organs of this distinctive genus of fern-like plants and certain aspects of its internal structure.

The second facet of Canadian history that incited our interest in another part of Ellesmere was the Greely Arctic Expedition of 1881–84. Much has been written about this tragic venture and it will be recounted here only to introduce a fossil plant locality that attracted our attention.

The Greely expedition was one of two groups sent by the U. S. government to participate, with several other countries, in the first International Polar Year. The group was composed of 25 men who spent two winters at a site known as Fort Conger on the high northeast coast of Ellesmere Island. At the end of two years, when the likelihood of the arrival of a relief ship faded, the men set out in two small boats to make their way south through the ice fields between the Ellesmere and Greenland coasts. But they did not escape and a third winter was spent on the east central coast of the island where 18 of the men slowly died of starvation and cold. Of the seven who were found alive when a rescue ship finally reached them in June of 1884 one died a little later and six eventually returned from one of the grimmest of all Arctic exploits.

During the two-year stay at Fort Conger one of the expedition members, David Brainard, found a deposit of petrified logs near the tip of the Daly Promontory at about 81° and 30′ north. The specimens he collected were apparently abandoned when the party was forced to evacuate Fort Conger with only the more important



A seven-foot seam represents a considerable amount of plant debris and a milder climate in past geologic ages.

records and a small stock of supplies. Brainard's brief account had attracted our attention several years ago and it had been jotted down as a likely spot to investigate if an opportunity ever came along to reach that part of Ellesmere. We thought the chance had arrived when the facilities at the Lake Hazen camp were made available to us last summer.

Thus, at about 8:30 on the morning of July 15 we boarded a Canadian Air Force "Hercules" (flying box car) near Edmonton and, with an intermediate stop at Resolute Bay, we reached Alert at the northermost tip of Canadian land a little after eight that evening. This is a quick way to attain high latitudes but, packed in with many tons of baggage for the Arctic weather and military stations, comfort is conspicuous by its absence.

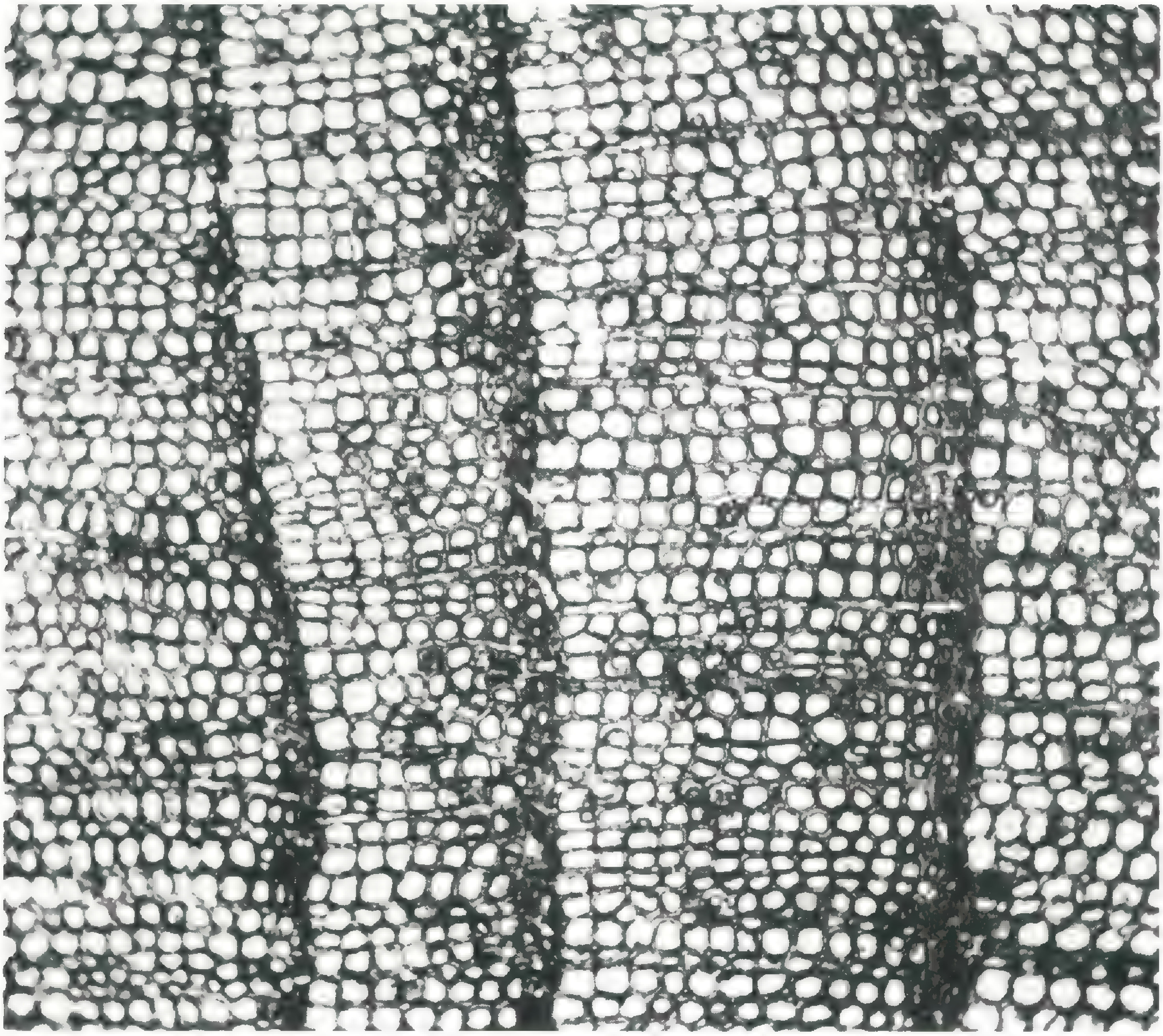
The air route to Alert across the north central part of Ellesmere passes over the United States Range where the mountains go up to 9,000 feet. This is a spectacular sea of great ice caps and glaciers flowing down onto the lowlands; it fits very nicely into the classic concept of what the Arctic should be like. The range extends to within a few miles of Alert which is I believe the northernmost permanently inhabited place on earth. The three days that we had to wait until a small plane came in to take us the 100 miles south to Lake Hazen were spent in roaming about the surrounding hills. The vegetation in the vicinity of Alert is rather sparse and perhaps 30 to 40 percent of the ground was still covered with snow. The temperature was well above freezing, however, and the snow and the numerous violent streams made foot travel slow and difficult. We collected a few flowering plants and observed more when we returned early in August. At the latter time we observed purple saxifrage that was just coming into flower, and judging from the close proximity of patches of snow that still remained it was evident that the plants had been exposed only a few days; yet within another two or three weeks they would almost certainly be re-covered with snow for another year. It is remarkable, as many observers have noted, that plant life can survive in this fleeting summer of only a few weeks.

We were not unhappy when the small plane arrived late one afternoon to transport us about 90 miles south to the Lake Hazen camp. The lake is a fairly large one, being about 45 miles long and some six or seven miles broad at the widest point. The Canadian Defense Research Board maintains a cluster of tents that serve as a base for a dozen or so scientists working in the area. At the time of our visit most of them were entomologists studying the all-too-thriving insect community. The hoards of mosquitoes that met us as we deplaned offered an unpleasant contrast to the Goose Fiord country to the south where, the previous summer, we had encountered almost no insect pests.

Aside from the lack of trees the Lake Hazen area is attractive as Arctic scenery goes. It is a long narrow valley surrounded by hills, those along the northwest side being foothills of the United States Range mentioned above and in ascending them a thousand feet or two one reaches the outlying fringes of the vast snow fields that cover much of the interior. In July and August the melt season is in full swing and numerous streams pour down into the lake.

The Lake Hazen valley has been described as a windless one; it is not quite that but the winds were much less strong than at Goose Fiord and it was decidedly warm during the last half of July with the mercury in the low 50's many days. These factors may account for the relatively luxurious vegetation. The Arctic willow in the vicinity of the camp produced a lush foliage with especially large catkins. The hillsides in many places are covered with acres of a heath *(Cassiope tetragona)* frequently intermixed with *Dryas.* The most colorful plant we observed was the fireweed *Epilobium latifolium* which occurs in great mats of many square yards on the gravel bars of the stream deltas. In the boggy lowlands two species of cotton grass flourished in great abundance and on moist muddy ground we found extensive stands of a dwarf horse-tail rush *(Equisetum)*.

The animal life is not without its interest. Arctic hares are abundant and we often met them in pairs or in small groups of five or six. A few



Part of a well-preserved piece of petrified wood (Magnified; the portion shown in the photograph is about one-half inch square). Fossil plant materials of this sort contribute to our knowledge of the forest of the past and the climatic conditions under which they lived. This wood, which was from a conifer, illustrates the details of its growth rings almost as clearly as if it were from a living tree.

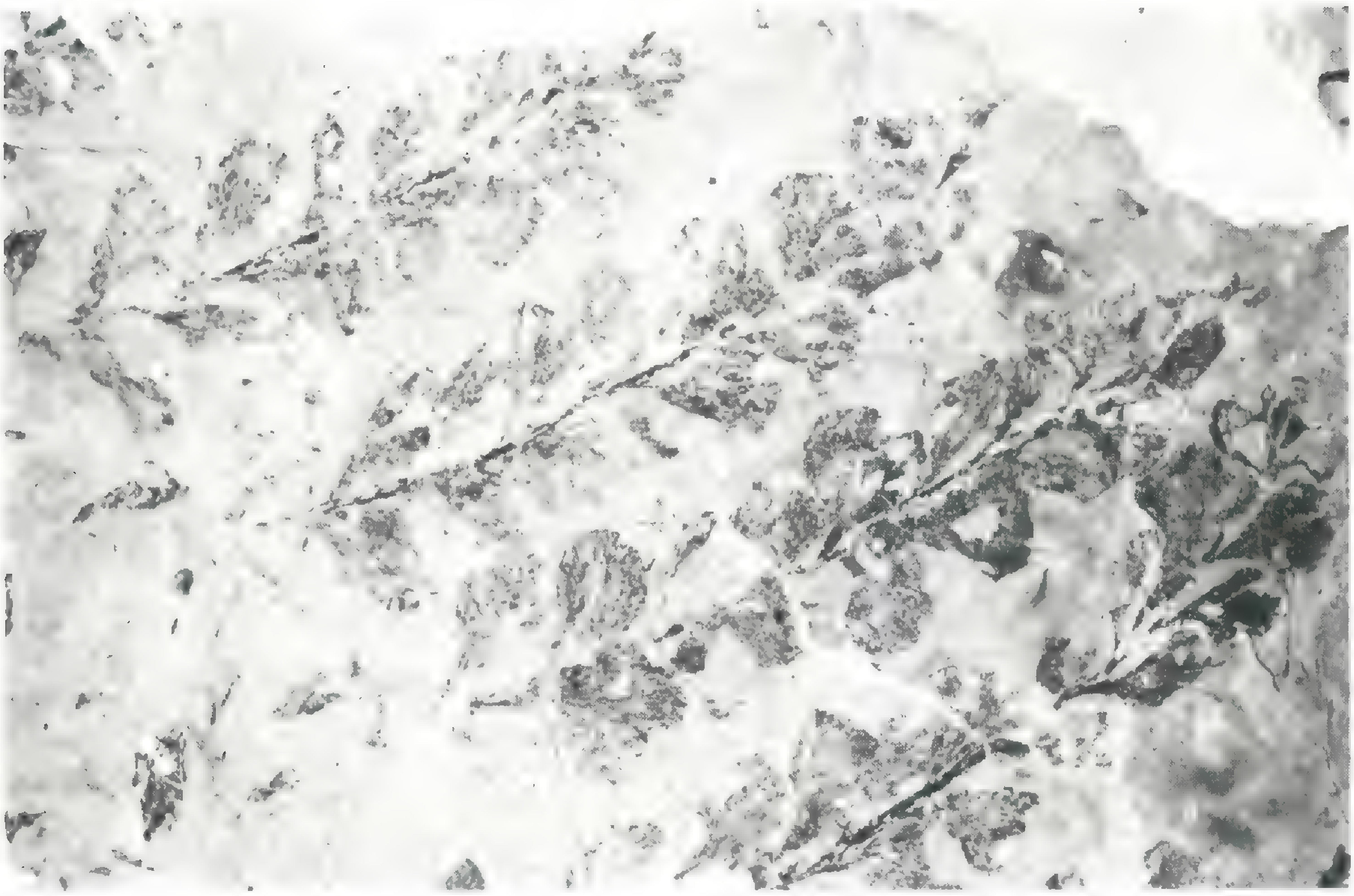
musk oxen inhabit the nearby hills; they are shaggy and formidable beasts rather like our western buffalo but so densely covered with long hair as to defy the deepest dives of the mercury. We spent an hour one morning stalking a pair in an attempt to get a few close-up photos but when we succeeded in closing the gap to about 100 yards it became abundantly clear that our presence in their domain was not at all welcome and we hastily retreated to continue with our proper business. Bird life is fairly prolific; a special feature was an eider duck nesting within a few hundred feet of the camp. She had apparently decided that no harm was intended and was an agreeable photographic subject. Weasels and lemmings are not rare but require a little more patience to find.

The particular time of our visit to

Finding a well-stocked cache of food three days out from camp added some real luxury to our menu, particularly since we were already on short rations.

Lake Hazen last summer was intended to coincide with a period when a helicopter would be available in connection with magnetic studies that were scheduled for the area. After waiting about a week we received the sad news over the radio one evening that the helicopter had been damaged beyond repair in making a forced landing on sea ice; fortunately no one was injured. A second blow was delivered to our plans when we found that the small plane that occasionally came in could not land within reasonable distances of the places we had selected for investigation, in particular Brainard's log deposit.

Even the lake seemed to be against us; earlier in the season a plane could have landed on the ice and saved us many miles of walking but by mid-July it was too soft to be safe for either walking or landing a plane. It had melted around the margin leaving a strip of open water 20 to 50 feet broad but for the most part it was shallow and rocky; occasional masses of ice pushed up on the beach during



Part of an *Archaeopteris* leaf from Ellesmere Island. This is a portion of the leaf showing four primary branches; the entire leaf was about three feet long and the plant as a whole was a good-sized tree with a trunk possibly several feet in diameter. Photographed looking straight down at the rock. When it was collected the whole face of the rock was greasy black. It was first etched with chemicals to bring out the plant remains. Just before photographing, it was flooded with glycerine to increase the contrast between rock and fossil.

the previous winter presented a formidable obstacle so that travel by boat was impracticable. We were thus left with our feet as the only means of transport. One does expect to do a good deal of walking but by the nature of fossil plants they are heavy and with a full pack including food, sleeping gear, clothing, cameras and such it is just not possible to carry a few hundred pounds of rock!

We chose to follow the lake shore as it is abrupt, in fact even precipitous in many places, and we could thus expect to find rock exposures and possibly fossil plants. Extensive coal seams had been reported in outcrops along the northwest side of the lake some 20 miles from camp, or about twice that distance by the route we followed. The coal seams that we did encounter presented dramatic evidence of the difference in climate millions of years ago as compared with the present. The one shown in the accompanying photo measured about seven feet thick and represents a considerable accumulation of plant materials. Samples of this were collected and the fossil pollen that it contains may be expected to shed new light on the forests of the time.

In the vicinity of one of the coal seams we found fragments of material scattered along the beach that appeared to be fossil wood. More careful study with our hand lenses left no doubts and a careful search resulted in the collection of a considerable quantity of petrified plants, a deposit that was previously unreported. The specimens that have been studied thus far suggest that the forest they represent was predominantly a coniferous (evergreen) one. A small portion of a specimen is shown in the accompanying illustration; this is a cross section of part of a log that has been cut with a diamond saw, ground very thin and photographed through a microscope. Parts of four annual rings of growth can be seen.

At another point along the beach we found a thin band of black shale which contained fragments of fern leaves and other plant materials which promise to add another small chapter to our growing knowledge of Arctic floras of the past.

The Arctic, even in 1963, is a rather remote region especially when transport plans bog down; although we enjoyed a full share of frustrations last summer, failing to reach two specific objectives, we did find other fossil plant localities that were previously unknown and we will return another year to continue the search.

* * *

GOLDENRAIN-TREE. *KOELREUTERIA PANICULATA*

This handsome flowering tree matures early and begins to flower within a few years of the time when it is set out. Under our conditions it is not usually a long-lived tree and the Garden has no ancient specimens. It does reproduce itself in St. Louis though not to the point of becoming a troublesome weed. All but one of the goldenrain trees now in the Garden originated as volunteers in beds of shrubbery and because of their beauty were encouraged to develop instead of being eradicated. There is one just north of the Administration building along the boundary wall, another dominates a shrubbery group just west of the northern entrance to the Mausoleum grounds and there are a pair east and west of the hedge collection.

Like goldenrain-trees everywhere, these specimens are particularly appreciated in the garden picture because they flower in early summer when other flowering shrubs and trees have all gone by. There can be as much as two weeks difference in flowering dates between one tree and another but in

St. Louis they all bloom within the month of June.

The bright mustard-yellow flowers are small, about one quarter of an inch in diameter, but they are set by threes in conspicuous upright panicles usually well over a foot in length. These open panicles terminate branches and form handsome well-spaced sunbursts all over the top of the tree and to a lesser extent down the sides.

The tiny flowers are followed by large, three-sided papery seedpods of a clear pale green which are almost as beautiful as the flowers and remain attractive most of the summer. Even in autumn when they ripen to a light brown they are not unsightly. When one is examined it is found to be mostly air. The spherical, hard seeds are seldom much more than three to a capsule and are no more than a quarter of an inch in diameter. In the Orient they are pierced and used as beads.

The goldenrain-tree is native to China, where, for instance, it is common in the hills around Peiping, and to Japan and Korea. It was introduced into European gardens in the middle of the eighteenth century and has been reported by visiting botanists as doing well in an old garden along the Grand Canal in Venice. Though it reached North America many years ago it has been slow to be recognized by American gardeners until very recently. This may partly be the result of a scientific name that was cumbersome to write and difficult to pronounce during the many years that it had no generally accepted common name in English.

Botanists as well as gardeners stumble over "Koelreuteria" when they try to pronounce it. In English-speaking countries the rules say to put the accent as in Latin and give the vowels the sounds they would have in English. But the rules keep discreetly silent about what to do with German names like these. The second syllable is bad enough. It is commonly rendered "root" as if it really were English, but "royt" is frequently heard in conscious or unconscious tribute to the original German. The first syllable with its "oe" becomes "coal" or "kell" or "kale." Occasionally, in German-American communities, it achieves that strange blend of all three of these, the correct German voicing so difficult for English throats.

This confusion would be less irritating if both scientists and gardeners knew more about Joseph Gottlieb Koelreuter, professor of natural history at Karlsruhe. Just 200 years ago he was concluding the world's first thorough study of hybrids between species. He put down important foundation stones for what today we call Genetics. He not only produced hybrids but crossed them back again and again to the species from which they came, reporting the results with patience and precision. He was a hundred and fifty years ahead of his time. It is appropriate that this tree which honors his name should be so distinctive as well as so beautiful.

In only one spot did the goldenrain-tree rapidly become really popular in the United States. William Maclure, the pioneer Scottish geologist and philosopher, who was one of the founders of the cooperative community at New Harmony, Indiana, planted it by his front gate. It did well there and acquired the local name of "Gate Tree." It was not only planted locally but it has begun to be naturalized in that part of Indiana. Apparently it has done so in other parts of the eastern United States for the last edition of Gray's Manual of Botany lists it as "beginning to spread from cult." Rehder's Manual of Cultivated Trees and Shrubs lists it as hardy as far north as Zone V, which is a broad band of country from northern Oklahoma to St. Louis and eastward to Ohio, central Pennsylvania, the lower Hudson Valley and as far north as Boston. Within this zone there is no record of its having been winter killed, though after very severe winters, trees have had occasional dead branches.

Even without its unique and spectacular summer flowers, the goldenrain-tree would be a handsome subject for parks and gardens. It tends to have a short main trunk with many slender, attractively sinuous branches which reach upward and outward. The leaves are so variously cut and divided that they give almost the impression of graceful fern fronds. There is no other tree in the Garden which varies so much in the technical detail of its foliage from leaflet to leaflet, from leaf to leaf, and from tree to tree. The leaf is always compound—that is, made up of separate leaflets, each one like a little leaf. The midrib always sticks straight out, six inches to a foot or even more. It is slender, green, and bare except for the points at which the 7 to 15 leaflets are attached. In the lower part of the leaf they are usually set exactly opposite each other in pairs, or very close to it. Farther up the midrib the pairs may become less evident or the leaflets may be truly alternate. The leaflets have three to five major notches on each side, deepest toward the midrib, frequently so deep that the lower of the lobes become separate leaflets. This is particularly noticeable in young saplings and in the fastest growing parts of an older tree.

With all their variation there is still abundant unity in the all over design. The leaflets are nicely spaced so that they do not overlap when laid down on a flat surface. They all come to a sharp point with finer toothing than elsewhere on the leaflet. They are always largest in the middle of the leaf and smaller towards either end. The terminal leaflet always has a markedly lateral lobe at the base, which is almost but not quite separated from it. In scores of little ways these complexly designed leaflets maintain the unity in their variety. All this to a perceptive eye becomes an overall impression of richly decorative foliage.

EDGAR ANDERSON

* * *

BOOK REVIEWS

Kansas Wild Flowers. William Chase Stevens. pp. 461. 774 figures, 761 from photographs. University of Kansas Press. Lawrence. 1961. $8.00.

THIS is a book with a flavor all its own. It was produced, mostly after his retirement, by a Kansas pioneer, who came there as a child of six, was trained there in Botany at the University of Kansas (with one year in Europe) and later became a teacher of Botany, a head of the Botany Department and a writer of successful textbooks. Late in his teaching career he conceived the idea of a volume on the wild flowers of Kansas, richly illustrated with clear, accurate photographs of the living plants. With the help, financial and otherwise, of many of his old students, with assistance from various colleagues and others interested in the Kansas flora, he carried the project to a successful conclusion and the first edition was published shortly before his 88th birthday. The second edition (for all practical purposes a reprint) was brought out during the Kansas Centennial.

Dr. Stevens' photographs are reproduced, usually two or three to a page, throughout the text and are accompanied by a few diagrams and maps. Most of them show the plant as it grew in the Kansas turf, or spread out against a neutral background immediately after being cut or dug up. To help indicate the scale, a rectangular grid at intervals of one inch is often photographed across the whole background. There are occasional pictures the width of the page, showing the plants in the landscape of which they were a part. Quite a number are close-ups of the roots and lower stems or the inflorescences with flowers or seed pods. All but a very few are still sharp and clear (i.e., the plates are not worn) and there are over seven hundred and fifty of them, the great majority close to four inches high and about two and three-quarters inches wide.

For each of the more than five hundred species which are treated, there is a little condensed technical information, a general description, and various comments in clear but professorial English. In turning over the pages of the book one hits upon an entry which is so good that one turns over more and more pages in the hope of finding one even better. In discussing the Gumweed, *Grindelia squarrosa,* (native also to Missouri, but not so common here as in Kansas, a kind of bright yellow aster with highly resinous foliage and flower heads) Dr. Stevens wrote as follows:

"The species is quite drought-resistant, owing to its deep root and resinous secretions; and because of its unpalatability to cattle and sheep it often takes possession of run-down pastures during protracted periods of drought. Then it is that in western Kansas we may see it in societies miles wide over the plains —an impressive sight.

"The unpleasant taste of the plants is usually due to their content of tannins, volatile oils, resins, bitter alkaloids and glucosides, some of which are valuable to us as stimulants, sedatives, astringents, purgatives, emetics, diuretics, antiseptics, disinfectants, etc. The Grindelias, having secretions of tannin, volatile oils, a bitter saponin, and 3 kinds of resin, were used by our native Indians for asthma and bronchitis and for colic in children; and the Pawnees boiled the flowering tops and leaves and used the decoction for bathing saddle sores and other rawness of the skin. * * * It is worthy of note that the bees, both wild and cultivated, have their own use for Grindelia, storing the comb with its nectar and pollen, untroubled by the fact that we find honey from it too strong in taste and too prone to granulate."

Most of the discussion of the Plains Larkspur *(Delphinium virescens)* is of general interest: "This wandlike perennial is a prominent feature of the prairies and plains in all quarters of Kansas, growing singly or in colonies among the grasses or along the undisturbed borders of cultivated fields—at the time of its blooming always rendered conspicuous by overtopping the grasses. Closely examining an open flower we discover 5 petal-like sepals, the upper prolonged backward into a spur, then 4 petals, each of the 2 upper with a nectariferous spur prolonged backward into the spur of the sepal, and the 2 lower overarching the upper and covering the many stamens and the 3 pistils. When a flower opens and for some time thereafter, the anthers are held in front of the nectar-bearing spurs, while in the older flowers, toward the base of the inflorescence, the anthers, after discharging their pollen, have moved aside, leaving the stigmas exposed in front of the spurs. Bumblebees—the most frequent visitors in quest of nectar—proceed from the base of a raceme toward its apex, so that on leaving a raceme with pollen from younger flowers on head and mouthparts they deposit this pollen on the stigmas of the basal flowers of the raceme next visited, thus effecting cross-pollination. The bees are so absorbed in their job that if we approach quietly, to avoid frightening them, we can stand close and see the whole show without danger of being stung. The carpels on ripening stand erect and close together.

"Many species of larkspur, if not all, contain the poisonous alkaloid delphinine, and in early spring when the larkspur is in leaf, but before the grasses are advanced enough to cover the range, cattle sometimes are severely poisoned by browsing larkspurs too freely. The dephinine has also sometimes been used for certain medicinal purposes."

Kansas is a long state from east to west, showing a gradual transition from an eastern to a western flora. Today most of that original record is gone, plowed under for corn, wheat, sorghum, and other crops. The long narrow fragments of the tall grass prairies of the eastern part of the state, and of the short grass plains of the West, which used to be preserved along highways and railroad rights of ways, have become more and more eliminated by extensive grading and spraying for weeds. Kansas Wild Flowers, was produced when the remnant of the vegetation the pioneers knew was already imperfect but much better than it is today. It is an important record.

EDGAR ANDERSON

A Lady Botanist of the American Wilderness. Botanic Manuscript of Jane Colden 1724–1766. Published by the Garden Club of Orange and Duchess Counties, N. Y. 205 pages. $10.00. Address for orders: "Jane Colden Botanic Manuscript," Box 389, Newburgh, N. Y. Chanticleer Press, 1963.

THIS fascinating book presents in careful facsimile a substantial portion of a manuscript flora of New York prepared on the frontier a generation before the Revolution by the gifted daughter of a remarkable family. Her father, Cadwallader Colden, during nearly all of her lifetime was Surveyor General of the Colony of New York and then became Lieutenant-Governor of New York for the last fourteen years of his life. He was given grants of land totaling 3,000 acres, 100 miles west of Newburgh in a region of what he described as "mellow soil." When Jane was four he moved his family to the new home in the wilderness, so remote from other families that there were no schools and Jane was educated by her mother and father. He was already a botanist of parts and even after he moved to the frontier kept in touch by letter with leading botanists and plant collectors in Europe and the colonies. He was familiar with Linnaeus's new system for identifying plants, translated it for her out of the original Latin (making up his own English equivalents when none were available in common speech), taught her how to use it, and encouraged her to produce this detailed local flora.

Two members from the staff of the New York Botanical Garden, Dr. H. W. Rickett and Elizabeth C. Hall, have edited the volume and provided interesting introductory essays, touching on the young woman, her family, and the manuscript itself. Each of the facsimile plates in Jane's handwriting is accompanied by an exact letter-by-letter printed version. It has the charm of those days when "April," to take an actual example, could be spelled "Apprile," "Apperill," and "Apprill" on successive pages. Some of her drawings, mostly of leaves, add variety to the text.

Jane's drawings, while charming, have little technical merit, but her long, precise, detailed descriptions are a tribute to her father's teaching and her own innate ability. On the basis of them Dr. Rickett has confidently assigned modern common and scientific names to each of the selections and this list is printed as a table of contents.

The book has been so tastefully designed and the various parts of it fit together so effectively that reviewing it has been a privilege. One goes back again and again to the full page reproductions of the old portraits of Cadwallader Colden and his wife with which the book begins. Each was evidently a person of ability and charm and force. They are so exactly the kind of people we read about in the notes and whose daughter could have produced such a manuscript in the wilderness. One facet of their life together shines brightly at us across two centuries.

This is a limited edition; it will certainly become a collector's item.

EDGAR ANDERSON

KNOW YOUR GARDEN

THE Women's Association began in February of 1955 as a group of seven women appointed by the Board of Trustees and subject to the Board's approval. They have helped the Garden in various ways, with fund-raising, in sponsoring social events, and in assisting with various enterprises at the Garden. Their successive Chairmen have been: Mrs. Martin Lammert III; Mrs. William J. Hedley; Mrs. W. Warren Kirkbride; Mrs. Bruce Butler; and the present Chairman, Mrs. George Pettus.

⁂

FIVE prominent botanists met at the Garden and at Washington University on February 28th and 29th, having been appointed by the Trustees as an Advisory Committee to the Board. They were: Dr. Arthur Cronquist, Curator, New York Botanical Garden; Dr. G. H. M. Lawrence, Director, Hunt Botanical Library, Carnegie Institute of Technology; Dr. Harlan Lewis, Dean of Life Sciences, University of California at Los Angeles; Dr. Rogers McVaugh, Professor of Botany and Herbarium Curator, University of Michigan; Dr. J. D. Sauer, jointly Professor of Botany and of Geography, University of Wisconsin.

⁂

MR. DANIEL K. CATLIN, a member of the Board of Trustees since November of 1926, was made an Honorary Trustee at the Board meeting on February 26th. He pressed his own resignation with characteristic firmness. In urging him to come to the meeting he had been jokingly told that his presence there would insure a quorum in passing on his request. At the meeting when all routine business was about to be deferred, he forcefully reminded the President of the Board of this promise. In assenting to his request the Board paid tribute to his nearly forty years of service and hoped that he might exercise his privilege as Honorary Trustee and meet with them when he conveniently could.

⁂

CHILDREN are still admitted free into the Climatron when accompanied by adults, but the maximum age limit has been reduced from 14 to 12 years.

NEW MEMBERS OF THE FRIENDS OF THE GARDEN

February 10 through March 6

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Mrs. Alaine M. Arndt
Mr. and Mrs. Robert L. Beatty
Dr. and Mrs. Virgil Bleisch
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Mr. and Mrs. Oscar E. Buder
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Mr. and Mrs. Gideon Schiller
Mr. John N. Shalhoob
Mrs. Warren A. Taussig
Miss Winifred Tittmann
Mrs. Eugene F. Williams, Sr.
Mrs. Clarence T. Wilson

ANOTHER PICNIC FOR THE FRIENDS

Sometime in April there will be a Spring Picnic at the Gray Summit Arboretum for the Friends of the Garden. By waiting until the last possible moment it is hoped that a time may be chosen when the thousands of daffodils of many varieties will be at their loveliest. As soon as the date is set, printed invitations will be mailed out to all the Friends of the Garden, giving details of the event. There will be no organized activities other than enjoying the landscape and its springtime bloom.

* * *

A Good Early Crocus for St. Louis

After the bright purple-blue *Crocus tomasinianus* had made itself at home in the gardens of the late Charles Rice and of Dr. Frederick Comte, the Garden bought a quantity of bulbs and planted them at several spots. At one of these they did very well and increased rapidly. Mr. Brenner then transplanted these out in other parts of the garden, selecting spots that seemed to have similar characteristics. These were areas with bright winter sunshine but with light summer shade. They were close enough to trees so that the sod was not thick and the crocuses could be planted in little gaps between the mats of grass. In many of these spots they have done increasingly well and the clumps of flowers get larger each spring. They come so early that they are usually all out of bloom by the time the ordinary crocuses are in flower. This year they were in perfect condition during the first week of March.

E. A.

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HENRY N. ANDREWS, Paleobotanist

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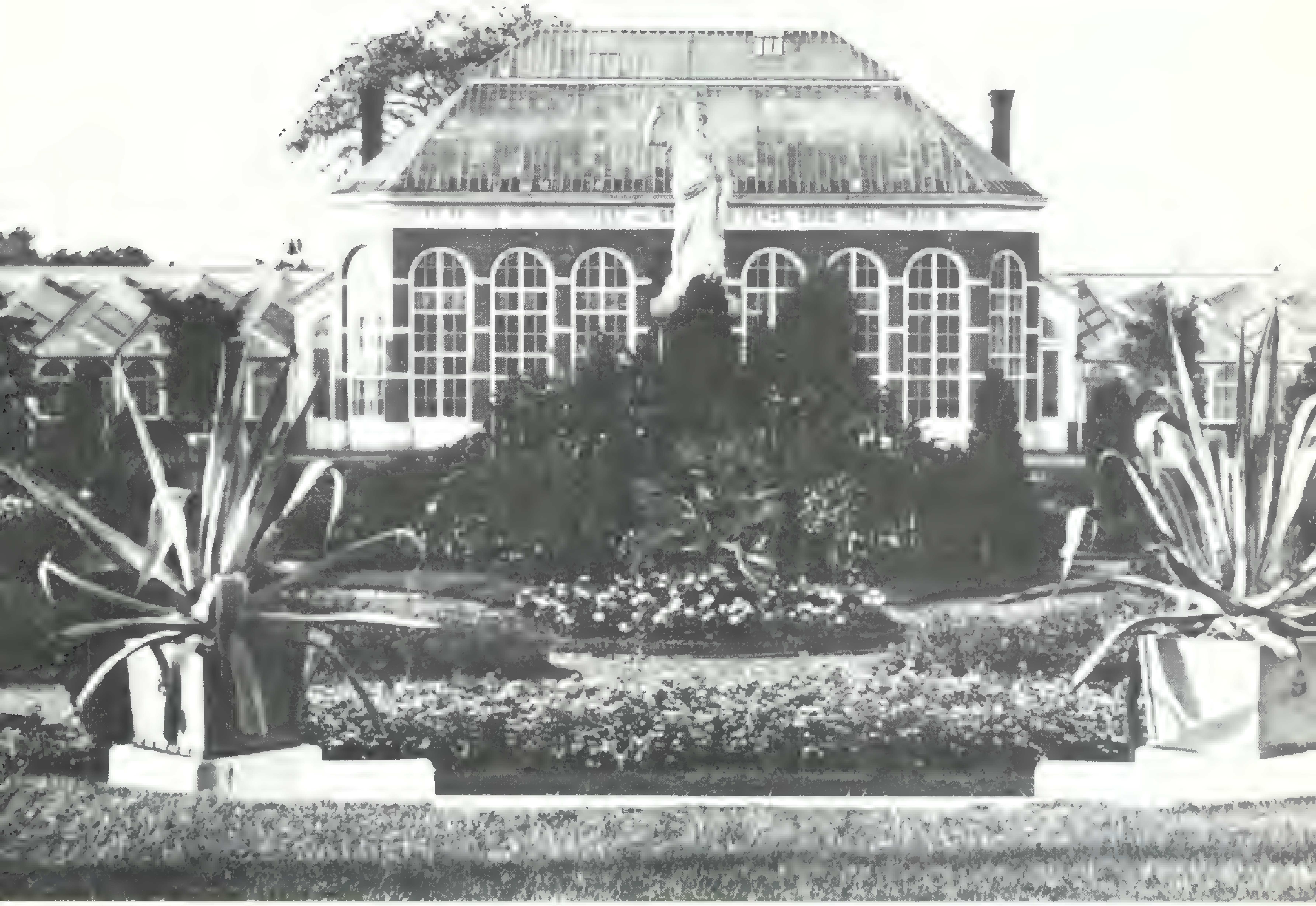

Special Issue

ST. LOUIS BICENTENNIAL

The Garden as Laid Out by Henry Shaw

COVER: The Old Palm House built by Henry Shaw as it looked in 1895. Note the characteristic Victorian mixture of statuary, bedding plants, and big tubbed specimens of Century plants, palms, Norfolk Island Pines and the like. When this Palm House was succeeded by a rose garden on the same site its deep and heavy foundations, almost impossible to remove entirely, made it difficult for the roses, particularly in dry summers.

PHOTOGRAPH FROM DR. WM. G. SWEKOSKY

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The Garden as Laid Out by Henry Shaw

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LII No. 5 May 1964

THE GARDEN AS LAID OUT BY HENRY SHAW

In this Bicentennial year it seems appropriate to offer these views and descriptions of the Garden as Mr. Shaw planned and developed it. A hundred years ago he was vigorously pushing ahead with buildings and grounds and collections. The garden he created remained the same in its essentials until changing conditions which no one could have foreseen forced radical changes at the time of World War I.

The memories of Mr. George H. Pring of the Garden as he first knew it are almost like a direct contact with Mr. Shaw and his times.

E.A.

HENRY SHAW'S ARBORETUM

GEORGE H. PRING

My first impression of the Garden on March 13, 1906, was that which Henry Shaw left to the people of St. Louis in its original form. It included farm land from Vandeventer to Kingshighway where the original Henry Shaw Public School stood. The building was built and paid for by him and presented to the Board of Education of St. Louis. This farmland, where stood the school, later had to be purchased by the Garden before it was subdivided for residences about 1920.

The south boundary began at Kingshighway and Shenandoah east to Alfred, south to Magnolia and then east to Tower Grove Avenue. The east boundary ran along Tower Grove Avenue from Magnolia to the north.

The south end of the Library and Herbarium was built in 1908 carrying out the same design as the north building, which was Henry Shaw's downtown residence. The Cleveland Avenue gate house was built and occupied by Henry Shaw's valet, which was Henry Shaw's wish before he died. By the way, the ladies' waiting and restroom was a part of this building which was later changed when the new Main Gate was built.

The present Main Entrance was designed to resemble Henry Shaw's original entrance with the exception of the present information office which at that time was the gate keeper's residence including an upstairs. The only remaining landmark of the original gate is the lettering: "Missouri Botanical Garden 1858" located above the center gates. The gate to Henry Shaw's Fruticetum was located at Russell Avenue which is now closed by the stone wall, and in my time was in very good shape. The north boundary was Shaw Avenue extending west from Tower Grove to Vandeventer.

The main garden of Henry Shaw's time was separated from his Arboretum and pasture land by a rock wall continuing from the west wall of the Linnean Garden south to where the old specimens of American Holly are growing. The east side of this rock wall was used for trained figs. The wall enclosed the original Henry Shaw's flower garden and separated it from his Arboretum and farm land. As the visitors entered the Flora Boulevard Main Entrance they could view Henry Shaw's Sunken Garden with Juno as the axis. The present circular Water-lily Pool still has as its center the foundation of this statue. Here the early Chrysanthemum Shows were staged in a tent, using the flower beds as staging areas.

Henry Shaw's Conservatories, which faced south towards his home, stood at the spot where now stands the present circular rose garden. The east section was heated by the old flu system, the Arboretum supplying the cord wood. Behind the conservatories could be seen the service and private growing houses framed by more modern type houses on the north, by the dome range running east to west. Between the center Orchid House and Henry Shaw's Linnaean House built in 1882 was the Victoria Pool which was heated by the same boiler that supplied the heat for the Linnaean House.

The present red brick wall east and west in the Linnaean Garden separated the main garden from the Fruticetum. The building of the large conservatories in 1912 under Dr. William Trelease the Director and later completed under the directorship of Dr. George T. Moore in 1913 necessitated the removal of the old rock wall, thus opening up the Arboretum as a part of the main garden.

Now may we take a trip with Henry Shaw through his Arboretum beginning at his country home, Tower Grove House? His coachman has just brought his private horse-drawn victoria from the carriage house situated south of the residence. He invites us to enter and we head northwest through the Avenue of Osage Orange *(Maclura pomifera)* running behind the present Climatron. Upon entering the Avenue, which borders the farm, he points across the road to his rock barn and the two-story rock residence of his farm manager. He then draws our attention to an unusually shaped Maidenhair Tree *(Ginkgo biloba)* at the end of the rock wall which is about 30 to 40 years old. Today this unusual spreading tree is damaged. Due to a cyclone it no longer has the same inverted branches. It can be seen on the east side of and near the entrance to the new Rose Garden. As we continue along the Avenue Mr. Shaw draws attention to the fact that both the male and female Osage Orange Trees are represented. The largest specimen is to the east of the Avenue and then he excitedly and

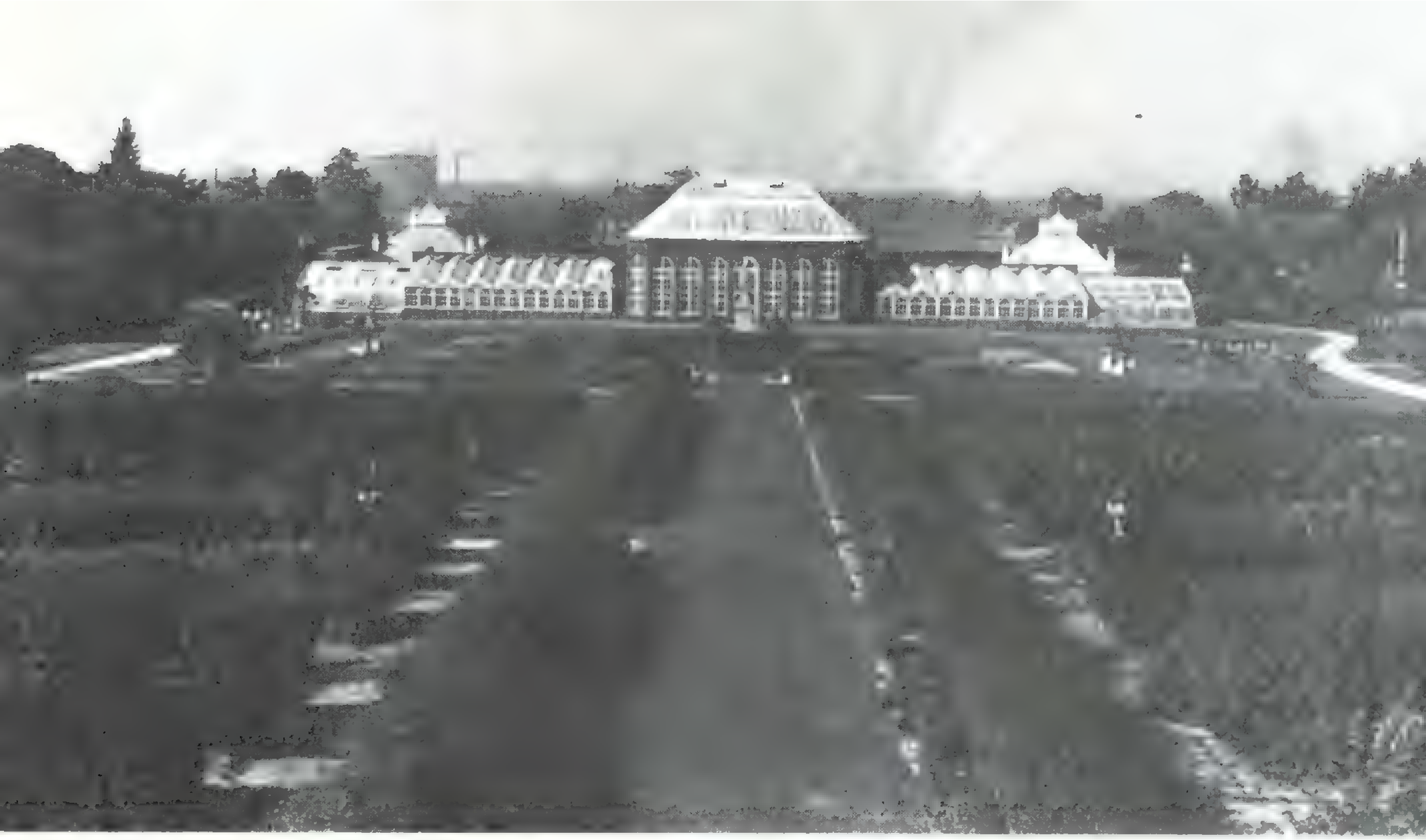
The "Pagoda" as seen from the north. The Museum, the Cleveland Avenue Gate House and the Victory statue at the left of center. The old ginkgoes which hide most of the view of the Gate House were nearly as tall then as now but they have had branches (and sometimes the whole top) blown out in high winds and made good recoveries.

Pagodas, Temples, and artificial "Ruins" were typical features of Victorian gardens. Kew still has its Ruins and an authentic oriental Pagoda. Tower Grove Park has Ruins and a charming little Chinese Temple. Forest Park once had what was called a pagoda but it looked much more like a hindoo temple than anything else. It was replaced by the present bandstand.

There were stairs to the second floor of the Pagoda from which the geometrical design of shrub and perennial beds stood out effectively. Many years ago a young librarian visited the Pagoda one evening with a junior staff member in whom she was not very deeply interested. At a park bench on the ground floor he greatly embarrassed her by proposals of marriage which she firmly refused, in spite of his persistence. When she came back to the library the next day she learned that they had not been alone in the Pagoda. One of the other young librarians had preceded her there the same evening with a young man to whom she was much attached. At the approach of the second couple they had quietly secreted themselves on the second story where they soon became an audience for the whole performance. This all took place about a half century ago but at the Garden the story is still remembered.

proudly points to a lovely tree which he calls the English Purple Beech *(Fagus sylvatica* var. *pupurea)*, age probably around 25 years and the only specimen in the Garden. Both Purple Beech and large Osage Orange can be seen south of the Floral Display House. We are now in the main part of the Arboretum still heading northwest, and we have come to an open creek covered by a wooden bridge. Mr. Shaw explains to us that this creek runs from Tower Grove Park through his pasture, through the Arboretum and turns east running to Lafayette Avenue forming a lake at 39th Street. He is very proud to point out the large specimens of the 30 to 35 year old Bald Cypress *(Taxodium distichum)*, (present location is Alfred Avenue Service Gate), evidenced by the many plantings in his main garden and also in Tower Grove Park. Driving toward the Arboretum Gate we note a large specimen of Pin Oak *(Quercus palustris)*, (present location is outside the Garden on Alfred Avenue between Castleman and Shaw).

In the "Fern Dome." George Edward McClure (at the left) in charge of exotics was about to return to his father's landscape business in Buffalo, N. Y., and had remained to help start off his successor, George H. Pring (seated at the right). Pring had come straight from England with a strong English accent and the latest thing in English clothes. Commenting on the high collar he recently said, "The fellows I worked with all guyed me about the extreme collar. A year later they were all wearing the same thing. They really gave me a rough time of it for a week or two. Then they all met with me and said, 'Well, we've let you have it and you've taken it in the right spirit. Now you're one of us.'" Mr. McClure, now in his eighties, is still associated with the family enterprises. In his later years he has specialized in cemetery design and development. PHOTOGRAPHED IN MARCH *1906*.

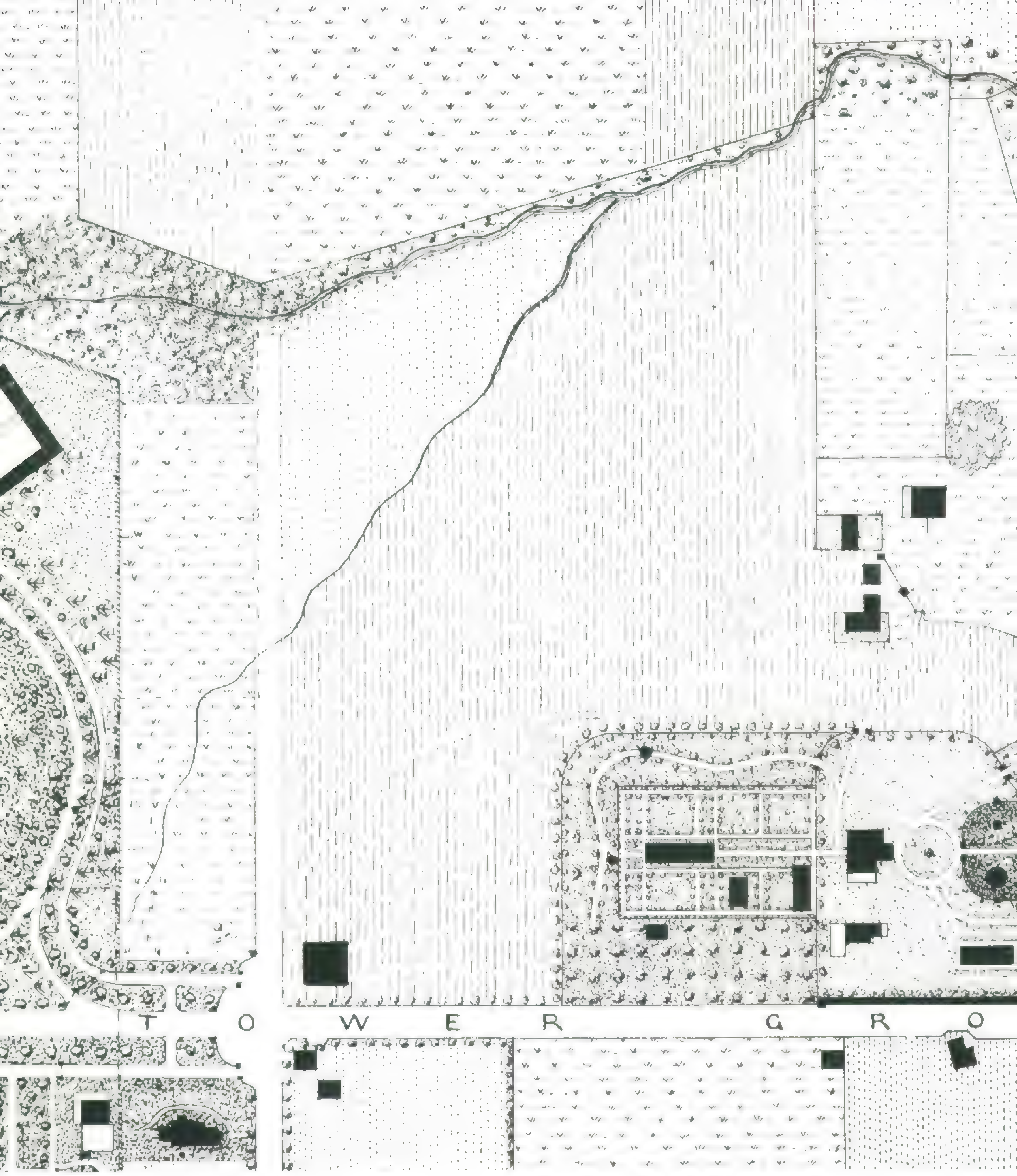


Looking north from the upper floor of the Pagoda in 1906. Formal beds, mostly shrubs and a few perennials. In the center the Parterre with its bedding plants and statue of Juno. Beyond that the old Palm House (1858 and 1868) and associated greenhouses. The older central portion is essentially like an orangery, a brick building with large windows let into its sides. The wings at left and right show progressive advances in greenhouse design. The sawtooth roofs next to the main building do not reflect a series of small greenhouses but are an attempt to achieve a big roof from a series of smaller sashes. The larger "domes" rising to the right and the left show the influence of London's Crystal Palace on greenhouse design.

The Linnaean House, completed by Mr. Shaw in 1882 shows its roof to the left and right. Beyond, the growing city of St. Louis.

The Arboretum contains many deciduous and evergreen trees including pines, hemlocks, cedars, spruce, hollies, soft and hard maples (all of which gave way to the present day residences with the exception of the Pin Oak mentioned) We are now approaching the Arboretum Gate at Vandeventer and Shaw. The cap stones are inscribed on the outside of the entrance with the following: "Henry Shaw" and "Tower Grove." (Exact location of the entrance was the circle at Shaw and Vandeventer. Cap stones and part of the columns are preserved and can be seen today as you enter the service yard west of the Linnaean Garden). Mr. Shaw points out to us that his head gardener, Mr. James Gurney, lives in the two-story residence located by the Arboretum Gate. We have gone through the gate and are now in open country which extends up to Grand Avenue We have finished our interesting visit with Mr. Shaw and he, being a typical Englishman and a gentleman, invites us to his home for afternoon tea.

Thus ends an exciting trip conducted by Mr. Henry Shaw himself through his lovely old Arboretum. A trip that in his day might have lasted an hour or more as he probably would stop his carriage many times to explain the history of each tree that he was particularly proud of, not to mention the many questions we more than likely would ask.

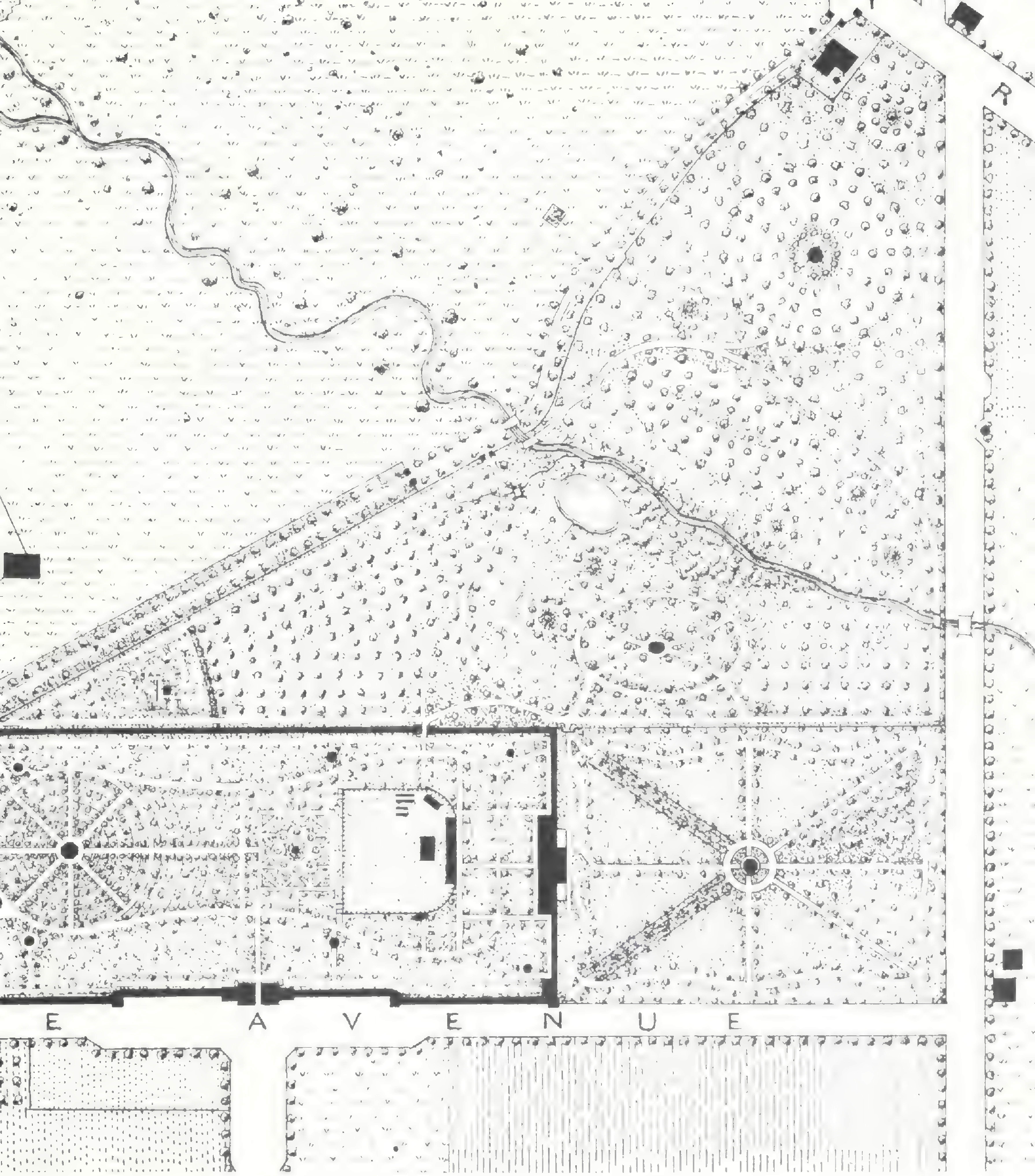


The central portion of an old map (slightly enlarged) which showed most of the surrounding farmlands. It is titled "Surveyed and Drawn by F. Tunica, St. Louis, Mo., Archt. & Engr. 1865."

Part of the old road to Manchester, the original approach to the property, passes at an angle through the upper right hand corner. In those days it made its way south and west before reaching the present Manchester Avenue in Maplewood. By 1865 Tower Grove Avenue had been established along the Garden's east boundary (bottom of the figure) and Shaw Avenue at the north (to the right but unlabeled).

Buildings, summer houses, statues, brick and stone walls, are shown in solid black; fences are single lines.

At the lower right hand corner is the Fruticetum, a large collection of choice fruits. Then continuing to the left, the Linnaean House (recently completed) and the developing tropical greenhouses, then the square Parterre with patterned flower beds, then the Pagoda with concentric circles



of shrubs and perennials. The large dark oval is the Grove of prairie shrubs and trees fenced in by Mr. Shaw. His house, Tower Grove, fronts on the same turf circle as it does today. Between the house and the street is the ice house. To the rear of his home is the large vegetable garden and associated buildings.

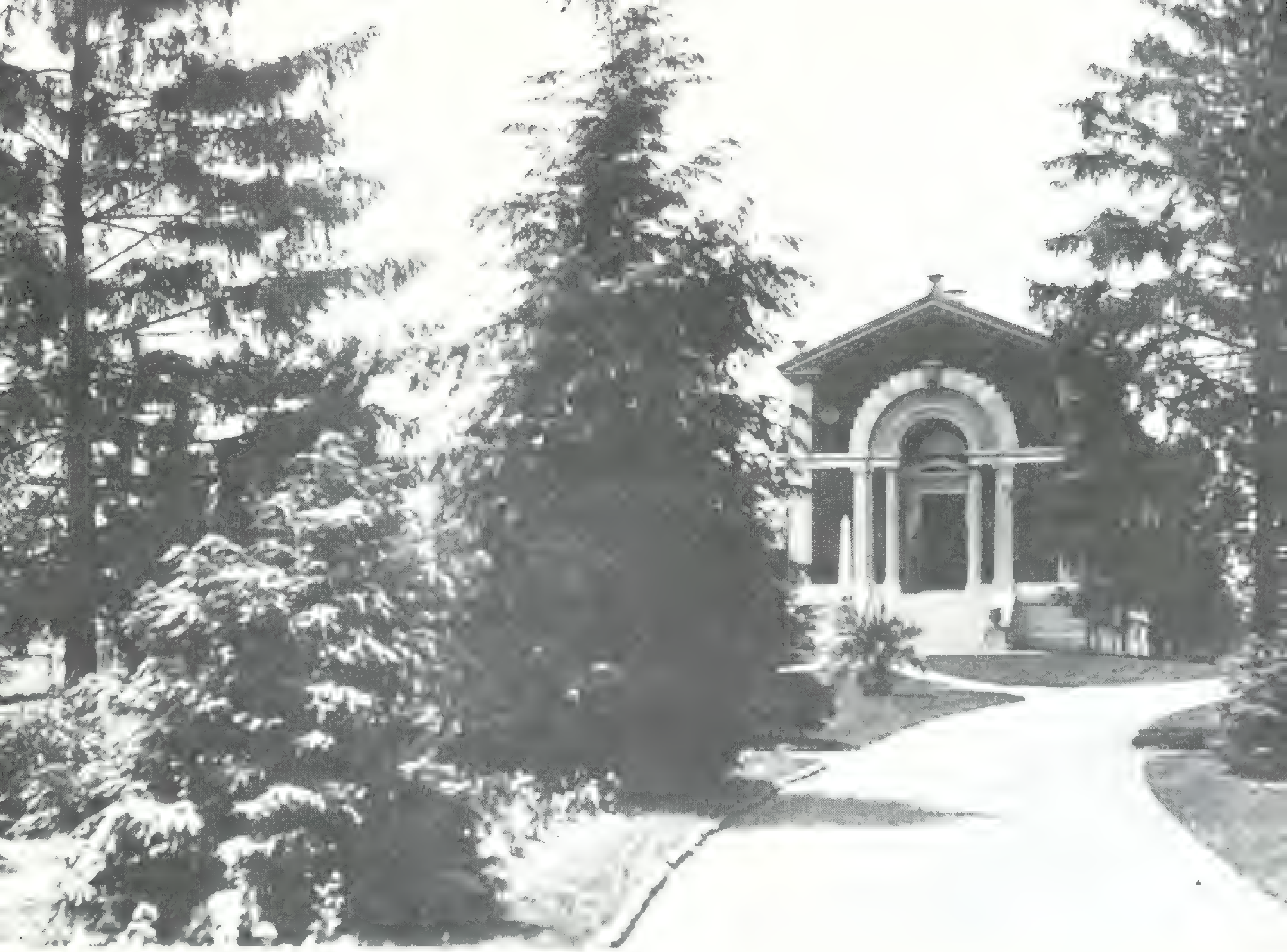
The black square above 'W' is the teahouse called The Casino, at the corner of Tower Grove and Magnolia, the latter Avenue only partly laid out. At the left of the map is the edge of Tower Grove Park showing the service sheds and the superintendent's residence. Along the edge of the park is the undeveloped area which went all around the park and was then planned to be marketed on long term leases for private residences, as is done in England, to bring in revenue for the Garden. The Arboretum, roughly triangular, is bounded on the side toward the farm by Mr. Shaw's entrance drive with its long straight section of Osage Orange hedges. The Museum is above 'O,' the Main Gate at 'A.'

Mr. Shaw on a walk through the Garden during the later years of his life. The lady is probably either his housekeeper, Mrs. Edom, or Mrs. William Trelease, the wife of the Garden's first Director. Mr. Shaw brought Dr. Trelease to the city in 1885 as head of the Henry Shaw School of Botany of Washington University. He was therefore familiar with Saint Louis and with many of the Garden's problems and opportunities when he was appointed after Mr. Shaw's death in 1889.

GARDEN MAINTENANCE IN 1906

GEORGE H. PRING

My observations of the early maintenance of the Garden included departmental heads. The Main Garden enclosed on the west by the stone wall was under the supervision of a Bohemian by the name of John Bannes. John had the typical military viewpoint. Most of the laborers at this period were Bohemians who had worked under Henry Shaw and were paid 35¢ per hour. The upkeep of the Garden was all by hand and there was no automation at this period. Consequently it was a question of hand mowers, with mule-drawn mowing machines for the larger areas.



The Museum and Library built by Mr. Shaw when he established the Missouri Botanical Garden in 1859 as it looked during his later years. Aside from the ornamental entrance it is closely copied after one of the Herbarium buildings at the Royal Botanic Garden at Kew. Originally it contained an herbarium and library as well as a museum of botanical curiosities. Since 1930 when the ceiling was restored it has been used increasingly as an auditorium. It is the regular meeting place of a number of horticultural and natural history groups as well as one of the chief centers for free lectures for school children.

Few of the handsome evergreen trees of Mr. Shaw's time survived very long after Mr. Shaw's death. As the city grew out and around the Garden, smoke became increasingly the Garden's most serious problem. When smoke control was achieved in the 1930's it became possible to grow evergreens more successfully. Modern air pollution, though more subtle in its effects, is still a serious problem in caring for the Garden.

The main floral displays were staged in the Parterre, the material being mostly tropical. The circular Hedge Garden surrounding the Pagoda was all pruned by hand. One could find an occasional planting of perennials. One section was devoted to hardy *Crinum longifolium* which produced large ball-like seed pods. These were very attractive to school boys who would hide behind the hedge and let loose.

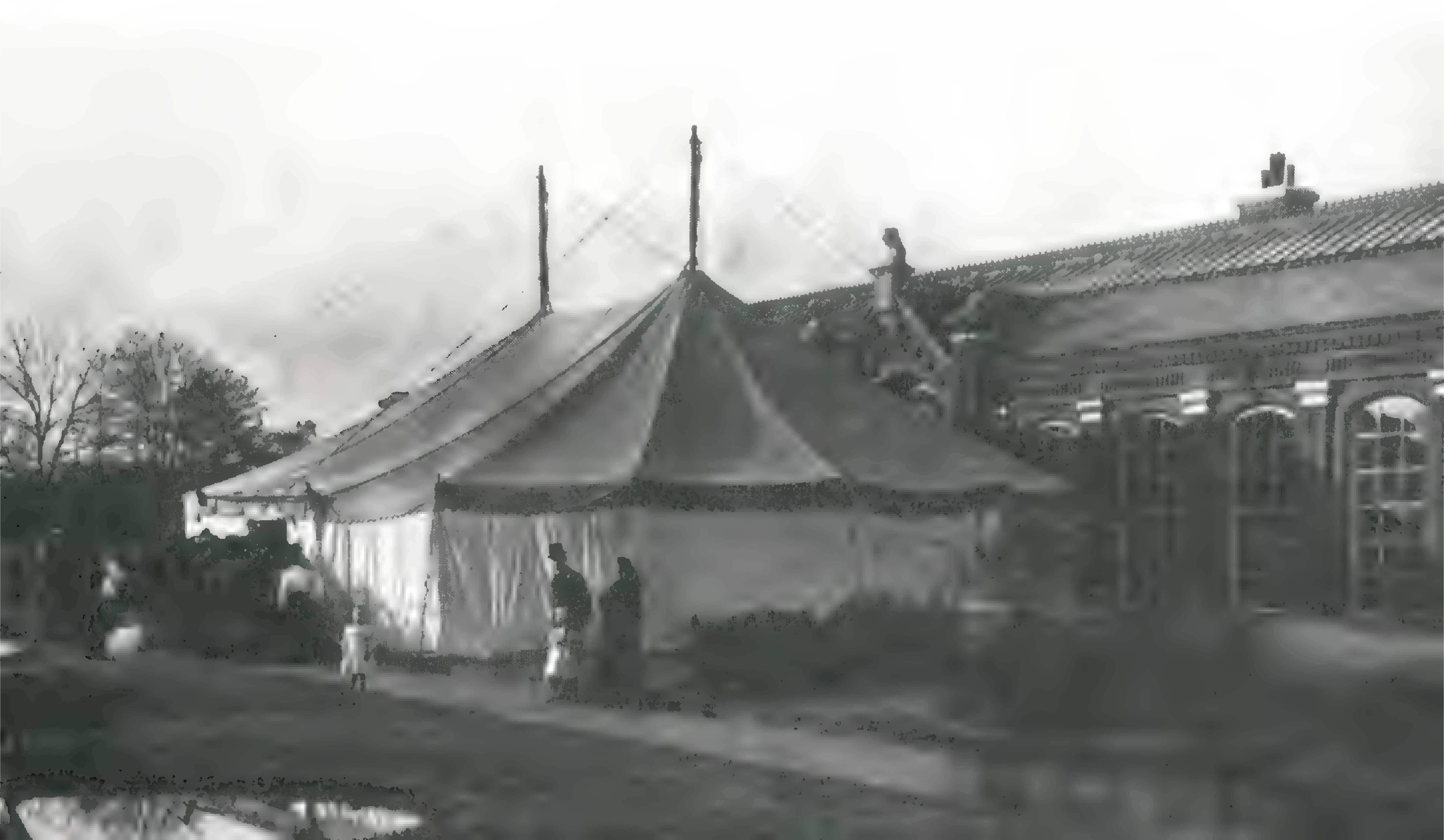
The Herbaceous Ground, which was where the new Rose Garden is now located, was under the supervision of Otto Bogula, who was one of our early Garden students who went to Kew, returning later to take charge of this area called the "weed patch" by Garden students. This garden furnished much of the seeds in addition to trees and shrubs for the Garden's annual seed catalogue distributed to botanical gardens all over the world. This seed catalogue was also under the direction of Otto Bogula.

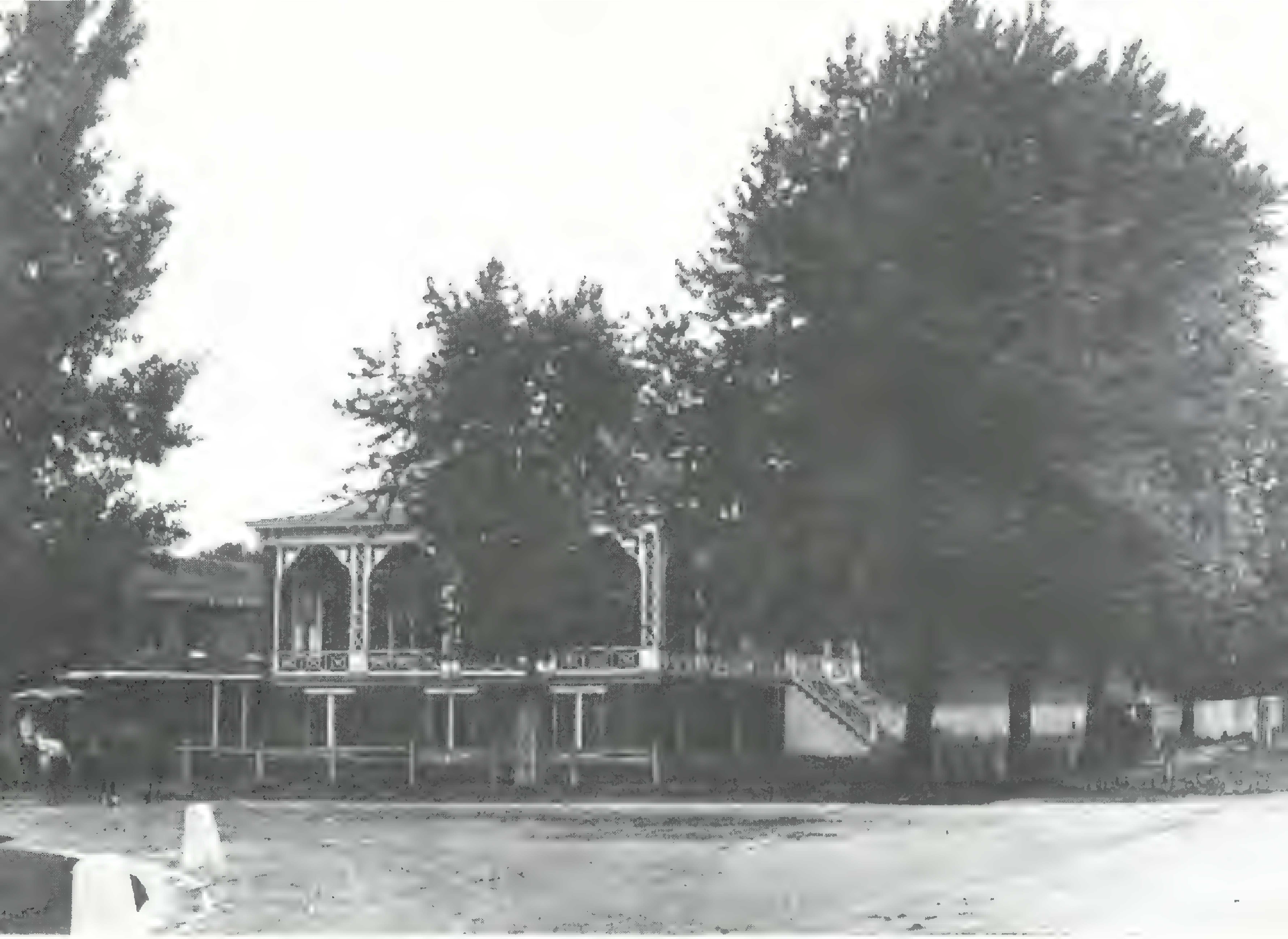
The North American Tract was finally planted according to the Olmstead Plan by Mr. John Kellogg assisted by a graduate Garden student, Mr. Charles Fullgraf.

Henry Shaw's farm was still in operation, the foreman living in the rock house next to the barn just west of the Residence. The Arboretum was under the care of Mr. Bannes. Superintendent Irish lived in the House at the Arboretum Gate located in the area of Shaw and Vandeventer. Henry Shaw's Fruticetum was under the care of Mr. Preswich, who lived in a Shaw residence at Tower Grove and Shaw, now a filling station. It was well planted with grapes, peaches, apples, pears, currents and gooseberry bushes. The crab apple trees at the north end of the area are from the original Henry Shaw stock. Henry Shaw's greenhouses to the east of Tower Grove residence were under the supervision of James Dunford. One of the small houses was devoted to Black Hamburg Grapes, the other house to forced vegetables. Mr. and Mrs. Dunford lived in the Students' Lodge, previously Henry Shaw's Tea House. There Mrs. Dunford acted as house mother.

Mr. August Koch was in charge of the Main Conservatories as well as the maintenance of small floral displays at

In 1905 the tent for the Mum show was immediately in front of the old Linnaean House completed by Henry Shaw in 1882. Note the widely spaced windows and the narrow band of sky lights along the top of the roof. Greenhouses as we know them were yet to come.





The Teahouse built by Henry Shaw at the corner of Tower Grove and Magnolia as it looked in 1890. It was called the "Casino" in his day. Tea and other light refreshments were served on the broad upper verandah which went around three sides of the building. Later it became what is known in Britain as a "Bothy," a lodge for young apprentices. It was finally torn down in 1913 when an official residence was built on this corner for Dr. George T. Moore, the Garden's second Director.

the west end of the Conservatories. The flowering plants were grown in two of the houses of the Private Range behind the Main Conservatories. Both Mr. Koch and Mr. Bannes lived in homes built by Henry Shaw at Tower Grove and Flad.

The Exotic Range including the one small Orchid House was under the supervision of George Edward McClure, whom I succeeded. It was interesting to note that Mr. McClure grew some Chrysanthemums for the World's Fair which the following year resulted in the first of the Chrysanthemum Shows in a tent staged at the Garden. This became a social affair being a Preview by invitation only from Dr. Trelease, the Director, and his Board of Trustees.

The Cactus and Succulent Department, a favorite of the Director, (particularly his research in the genus Agave) was under the direction of C. H. Thompson.

The average wage for departmental heads was $65 or $75 per month.

The Linnaean House was used more as a winter storage house for palms and the large collection of economic plants, all of which had to be moved outside for the summer. As I remember, it was a back-breaking job carrying these palms out.

Looking across the Parterre towards the original Main Gate.

Mr. Henry Shaw in his late eighties on a drive through Tower Grove Park with a coachman in uniform driving his handsome victoria. The party has paused for a picture just inside the east gate of the park. He is wearing his high silk hat and an opera cloak; his hands folded over the top of his cane. There are other pictures of him at about this same period, in the same outfit, listening to the Sunday Band Concert near the bandstand in the park.

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To Reach the Garden by Auto

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden. 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Volume LII No. 6 June 1964

COVER: The Main Gate which Henry Shaw built for his Botanical Garden. Though centered a little farther south it was on the site of the present gate. Its outer and inner face were very different, to match their surroundings. On the side toward Tower Grove Avenue were four square stone pillars, two of which can be glimpsed at the left of the picture. The rest of the building was faced on that side with rough stone which harmonized with the plain wall along the street. The inside, it will be seen, is of brick, with elaborate Corinthian pillars and pilasters. These were in keeping with the statuary, elaborately patterned flower beds, and big stone urns of the late Victorian design within the Garden.

The right hand part of the gate was a small apartment for the caretaker; note the chimney pots on the roof. The small second story window was matched by another on the street side so at least there was cross ventilation.

Much of the cactus and succulent collection was moved outside for the summer, though apparently it was displayed in different ways from year to year.

FRIENDS OF THE GARDEN

A STATEMENT FROM OUR PRESIDENT

"As most of you will recall, your Friends organization has had a rather active year starting with the music program presented at the Garden this past summer; our Fall Picnic at the Arboretum; the preview parties opening the orchid show and chrysanthemum show; and finally, our recent daffodil picnic at the Arboretum.

"Until recently, our campaign for additional Friends memberships had slowed down; however, this is once again well under way and extremely encouraging results are already evident. As is always the case, we urge you who are already Friends to retain your present membership when your dues are renewable, increase the amount whenever you feel you can do so and, in addition, talk up the Friends among your acquaintances. We are certainly looking forward to an active year with increased memberships."

Sincerely,
HARRY WUERTENBAECHER
President, Friends of the Garden

COURSE FOR ADULTS ON PREPARATION AND CARE OF LAWNS

INSTRUCTION on kinds of grasses and weeds and how to identify and control them. Preparation of ground for lawn establishment, soil conditioning, fertilizers and their application, rebuilding old lawns, maintenance and equipment will be discussed. Special attention will be given to individual problems. To register, telephone (TOwnsend 5-0440) or mail check direct to Garden.

Three sessions — $6.00; Museum Building; Tuesday evenings, 7 to 9 P. M., August 11, 18, 25; Instructor: Mr. Raymond Freeborg.

SUMMER EDUCATION PROGRAMS FOR CHILDREN

SUMMER is a special time for children and they should spend it as profitably as they can. One way this can be done is to have them register for the PITZMAN NATURE PROGRAM which begins on June 16 and 17 this year. The program is open to children 7 to 16 and is held 4 days a week, with Tuesday-Thursday and Wednesday-Friday sections, from 10 A. M. to 3 P. M. each day for two identical 5-week sessions. Registrations are made for either the Tuesday-Thursday or Wednesday-Friday section, not both.

For the first time, *a limit of 200 registrations is being imposed for each section.* This is necessary because certain facilities are limiting. Registrations for the first session begins June 1, and July 1 for the second session. Second session begins on July 21 and 22. Registrations may be made by telephone (TOwnsend 5-0440) or in person at the Main Gate. There is no charge for this program. Children staying all day should bring a lunch. Soft drinks will be available at a nominal cost.

The nature study activities offered in the Tuesday-Thursday section include bird study (given by members of the St. Louis Audubon Society), trees (with collections and identification), Insect collections, propagation from cuttings, and a general survey of the plant kingdom.

The Wednesday-Friday section includes everything offered above except bird study. In its stead, a new activity relating to plant families and the natural history of plants is being offered.

In addition to the PITZMAN NATURE PROGRAM, there is the Saturday

Morning Program which is offered every Saturday morning of the year (except July 4) from 10 A. M. to 11:30 A. M. This program is also free and no registration is required. The schedule for the summer months is as follows:

June

6 "Tags for Trees." Make plaster casts of leaves to learn their structure.

13 "The Queen of Flowers." Sample and study the fruits of members of the Rose family.

20 "Nature Hunt." A treasure hunt for leaves and seeds. Prizes awarded.

27 "Nature Films." A selection of the newest and best colored sound films.

July

4 Holiday. (No program will be held.)

11 "The Bread-Winning Family." Collect and mount grasses to take home.

18 "Dangerous Plants." Learn to identify poison ivy and other poisonous plants.

25 "Formulas for Flowers." Find new ways to look at flowers and mount several to take home

August

1 "New Generation." Collect seeds. Prizes awarded to collectors of greatest number.

8 "Uses of Wild Plants." Learn way to use wild plants as sources of water, food and dye.

15 "Table Top Greenhouses." Propagate plants from cuttings. (Bring 1 lb. coffee container and plastic bag large enough to cover.)

22 "Late Summer Landscapes." Draw or paint landscapes.

29 "How to Make a Terrarium." Small plants and soil for terrarium, supplied by Garden. (Bring a wide mouth jar or small glass bowl.)

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HOW TO REACH THE GARDEN BY AUTO

Coming in from the West, North, or South most routes will bring you sooner of later to Kingshighway. The most direct route to the Garden is then via Shaw and Tower Grove Avenues. From the South this is a simple right turn at a stop-light. If one is coming down Kingshighway from the North this requires a left turn onto Shaw which is forbidden during rush hour traffic in the morning and the evening. However it is possible to get from Kingshighway to Shaw quite easily even during these times. Coming from the North keep to the right edge of the highway while crossing Shaw (which jogs to the South at this intersection). This will conduct you into a one-way lane between Sala's Restaurant on the right and the Viaduct, rising steeply at your left. Immediately in front of Sala's Restaurant, at what is theoretically the corner of Kingshighway and Daggett, turn left under the Viaduct to a similar lane on the other side.

There is plenty of room for this maneuver but there are enough tall concrete pillars to steer between so that one has the impression of driving under a gate-leg table. A stop-and-go light on the right regulates one's re-entry into Kingshighway headed North. Almost immediately one turns right onto Shaw. Though this seems complicated the first time one tries it, it is safe, simple and expeditious. On the average it takes less time than waiting for the green-arrow-left-turn which is available at other times of day.

As one approaches Tower Grove Avenue (the second stop-and-go light) the old stone wall built in Mr. Shaw's time, becomes apparent at the right. The Garden's long frontage on this avenue usually permits of parking somewhere along it and one may enter either by the Main Gate at Flora Place, or the small Cleveland Avenue Gate opposite the end of Cleveland Avenue.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's from 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 9:00 P. M. and on Saturdays, April through October, as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

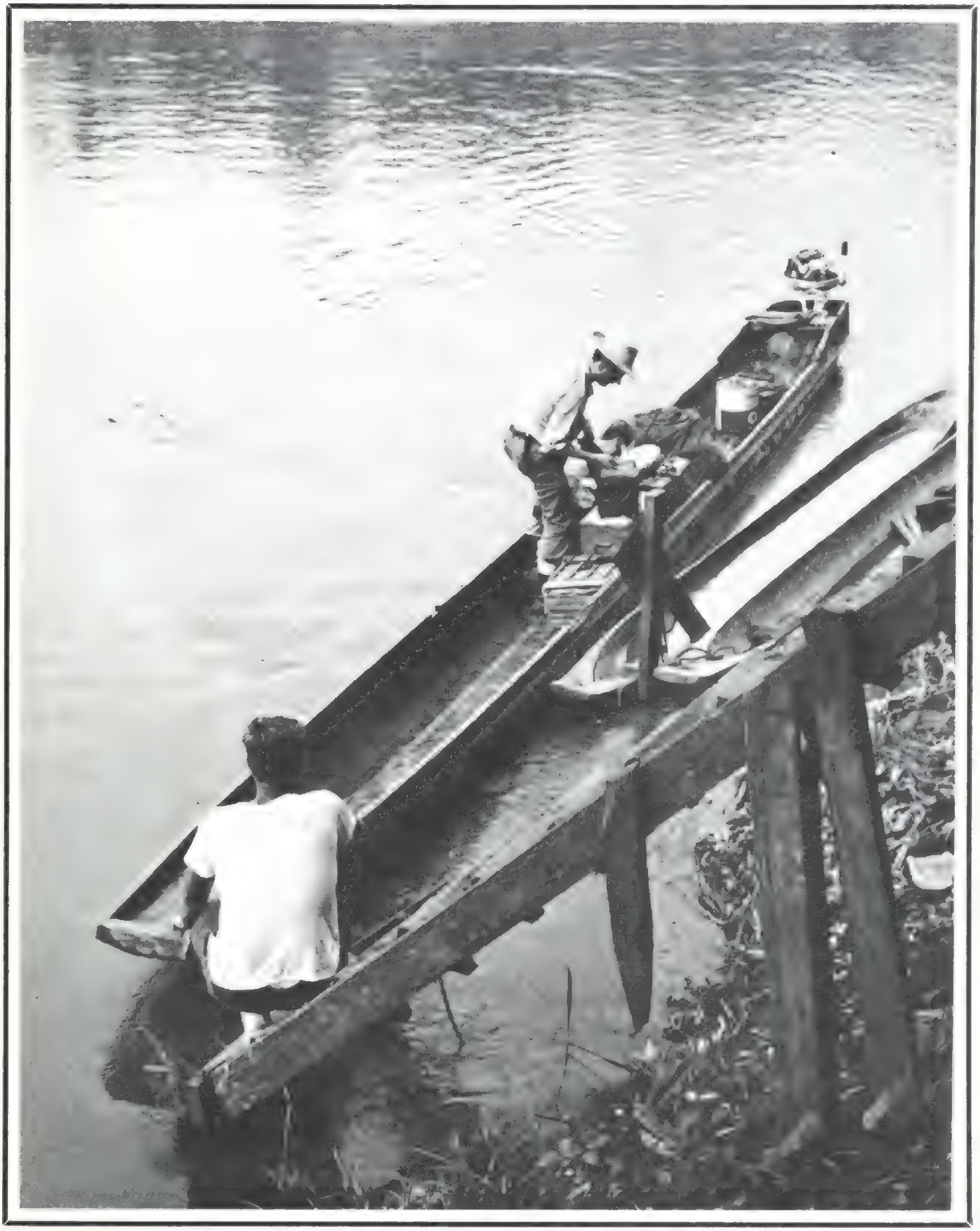
The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

September 1964
Volume LII
Number 7



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COVER: On the Chucunaque River in Panama, Alan Covich stows his field equipment into the boat preparatory to setting out to study the food and ornamental plants in the fields and dooryards of the Choco Indians. Covich was a St. Louis boy who worked at the Garden as an assistant to Dr. Cutler and in the Information Center at the Main Gate. His detailed studies of the plants grown by these Indians provided the raw material for his Honors thesis at Washington University and he is now proceeding to Yale to continue his graduate career in Biology.

PHOTO BY HOLLY ANDREWS

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden. 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Volume LII No. 7 Bulletin September 1964

STUDYING FOOD PLANTS AMONG THE CHOCO INDIANS OF PANAMA

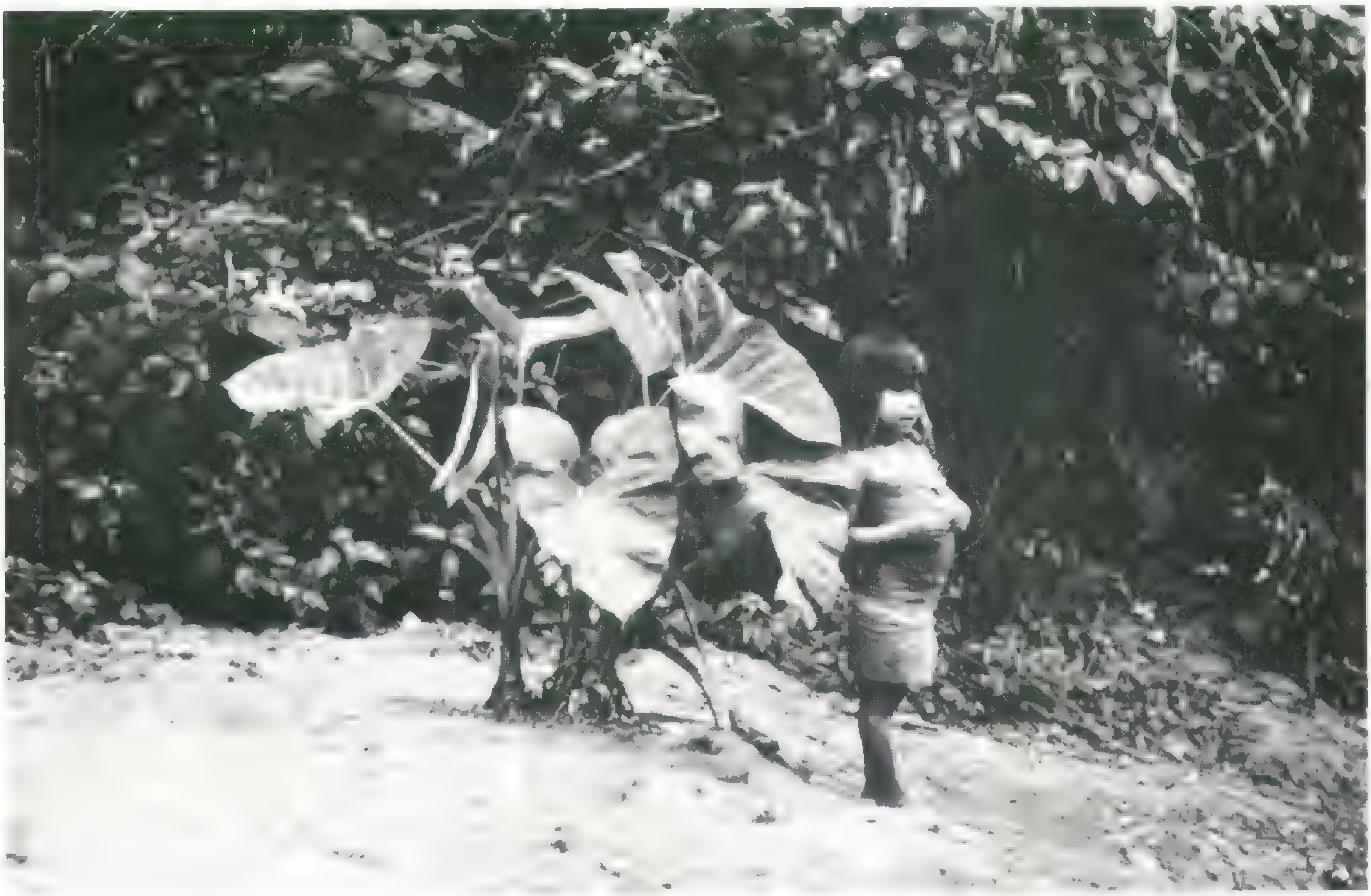
ALAN COVICH

For over fifty years botanists and students from Washington University and the Missouri Botanical Garden have been studying tropical places, especially Panama. For most people another such trip could hardly be worthy of great excitement. But for myself such an adventure seemed hard to believe. Yet, one day after final examinations in June 1963, I flew to Panama City. The opportunity resulted from Dr. Norton Nickerson's application for undergraduate research funds from the National Science Foundation and travel allowances from Washington University. Both Holly Andrews and I were to accompany Dr. Nickerson on a study of the Choco Indian "Gardens" of Darien, Panama. Darien is the easternmost province of the Republic of Panama and has an Indian population of about 4,000 with about 10,000 non-Indian inhabitants. Of this rather large number we visited with 119 along two rivers, the Chucunaque and the Chico. The Indians prefer to live in family units scattered along the riverbanks. Our purpose was to study the plants they grew in their clearings around their homes and in the fields they cleared along the river.

Rather than list our findings in neat tables and charts I would like to relate some personal observations on the people we met and lived with and the plants they grow. My first night with the Indians will long be remembered. I had already lost my glasses once in the river and was completely drenched by the heavy afternoon rains by the time we had arrived at our first Indian house (some twenty miles from Yaviza). We traveled by dugout canoes called *piraguas,* which are the sole means of transport. Most of the work of such a journey was taken care of by a not too powerful outboard motor, the likes of which appear on the boats owned by wealthier Indians. We had passed under the arch of a beautiful rainbow which appeared to stem from one of the golden thatched houses. At dusk we unloaded our supplies and met our Indian family. Both Drs. Sexton and Nickerson had lived here before so the event was quite a reunion. Then things were quiet and we ate our dinner in the dark and went to bed early. Through my mosquito netting I could see the Indians were just beginning their own meal. The Choco language sounded very strange indeed and as I fell asleep all I could hear was the clanking of dishes and the slaps of bare hands on bare backs as the Indians killed one mosquito after another. Not yet fully realizing my dreams were over, I heard the sounds of the Indian children rolling up their thin reed mats and eager to get a good look at us in the bright early morning sun. I found these children are literally wild little Indians, yet very respectful and polite. They take great delight in swimming and boating. Perhaps for this reason these Indians are noted for their cleanliness as they may take three baths a day in the river. The mothers scrub the little children while they do the family wash. It seemed strange that people who wear so little clothing should spend so much time washing clothes. Perhaps the women enjoy taking out their grudges on the clothes for they beat the material on rocks and boards with a small wooden paddle. The women wear a sarong-like skirt which they must constantly keep pulling up. Men wear a very thin and long loin cloth, and both sexes enjoy wearing a multitude of beads and other bright ornaments around the neck. In one instance we found a small fortune of U. S. dimes polished and fastened together as ornamentation. The men will usually put on an old long-sleeve shirt of western style before taking a river trip or going on a short hunting foray into the jungle. The few animals taken on these searches are cleaned in the river, usually below the washing area. They have recently replaced many of their bows with .22 rifles. The bow is made of black "chunga" palm *(Astrocaryum standleyianum)* and is about five feet long. The arrows are made of a lightweight reed with a double steel point and are over six feet long. Perhaps these arrows were also used when they speared fish. In the dry season they are reported to use several types of "barbascos" or fish poison which stun the fish and cause them to rise to the surface. The Choco use plants such as *Clibadium* spp. and *Piper dariense.* It is interesting that a similar technique is widely used by natives of both the Old and New World tropics. The blow-gun, which is reported as a customary weapon of the related Choco Indians of Columbia, was not seen. Perhaps the adoption of the rifle explains the lack of more native weapons and the decrease in the abundance of game. Thus, these Indians are relying on food grown around their huts and in their fields as well as the fish from the river for their existence. This fact becomes more interesting in the light that the geographer Carl Sauer has proposed the first farmers may have been sedentary fisherfolk living along fresh water streams.

We were fortunate to be studying with such a friendly group of people. Since the Choco travel considerably by river to market towns and to visit friends and relatives, they are accustomed to receiving guests in their homes. Their hospitality is cordial from the outset as food and a place to sleep on the floor are quickly offered. After staying with the same group for a few days, however, one begins to feel like part of the family. Of the twenty-six houses we visited, the largest number in one house was twenty-one where the head man's name was Liberto Caysamo. Here were four men, eight women and nine children. The family relations appear rather loose for the children do not usually think in terms of brothers and sisters; everyone is just one big, happy family. Not all Choco have large families, however, for at Elio Beloja's home there were only his wife and two children. Several other houses contained only five occupants. The make-up of a household may change from week to week as the men travel and may have more than one home. When a girl marries she usually has her husband live with her parents although some couples did appear to be starting out on their own homesteads. At these latter sites the numbers of useful plants growing around the clearing was quite small. It must require considerable effort to build a new house and clear the jungle for planting crops. It does become necessary to change the location of the cultivated fields after the soil has been depleted or weeds invade the plot. Usually the Indians will retain some sort of ownership of the house and go up or down stream to clear new fields. Since the families are quite spread out along the rivers, they will have room to rotate the fields. It has been estimated that the house sites are completely vacated after ten years, but this has not been proven. Many times the useful plants about the site will appear to be quite old, but it is hard to know how fast all of these tropical plants can grow. For a person who lives in an area where frost kills the herbaceous plants it is hard to estimate plant age in the tropics. A good example of this problem was when the Climatron filled rapidly with tropical growth and required pruning of trees such as the balsa. Old house sites may be re-inhabited after a number of years and the hardier useful plants such as fruit trees and palms will become part of the clearing again. Land depletion was probably not too great a problem when the Indians' diet consisted of more fish and meat than at present. However, as the rifle has been adopted and game depleted, the dependence on the introduced rice and bananas and the native corn has increased to the point that field rotation may be a future problem.

Since the numerous useful plants we were studying made up a considerable part of the Indian diet, a brief discussion of some of these plants is necessary before the comments on the diet as such. The only plant that was found at all the sites we visited was the plantain or platano (*Musa paradisica* L.). This fruit is a large, starchy banana which was introduced to the New World since the Conquest. It has become the mainstay of the Indian diet and is cooked in a variety of ways—frying, baking, boiling or steaming. To us these dishes were much tastier if the platano were more ripened, but the Indians seemed to prefer them cooked as green fruits. This crop is the major trade item for other goods. The dugouts are measured in the number of platanos that they carry. The next most numerous useful plant was "otoy" (*Xanthosoma violaceum* Schoot.) with a 76% frequency. This plant is related to our "elephant ear" ornamental but is planted about the clearing more for its edible root than beauty. Other roots grown for eating were tropical yams called "name" (*Dioscorea alata* and *D. trifida*) and "yuca" (*Manihot esculenta* Crantz) which is our source of tapioca and is sometimes called "cassava" in Latin America. This variety was sweet and tasted like very fluffy potatoes when deep fried. Among the grains we found that hill rice (*Oryza sativa* L.) was the main food served with almost every meal. It may be that rice is more productive and easier stored than corn, for although corn is still grown in considerable amounts it is being limited to the rice and platano field borders we studied. Rice is believed to have been introduced fairly soon after the Conquest and has had ample time to be adopted by the Indians. Sugar cane, also an introduction, has a favorite place among the Indians, especially those with a sweet tooth, for it is apparently the only sweet flavor they enjoy. Its use as a fermented "beer" was reported last year by Dr. Nickerson in the BULLETIN. When the juice is freshly squeezed by their press (which resembles the rollers on a wringer washer) it is most refreshing. The children suck on the stem sections as we might do on a lollipop. The main drawback is a few splinters in one's tongue. The starchy fruits of the "peach" palm (*Guilielma utilis* Oerst.) tasted much like sweet potatoes when boiled. A delightful tea was made almost daily from "hierba de limon" or lemon grass (*Cymbopogon citratus* Stapf) when we expressed our liking for it. We found that once you start liking something you will be served it at every meal. More than half of the sites we



An Indian child stands in front of an American aroid, *Xanthosma violaceum*, closely related to the more widely known Elephant Ear which is native to the Orient. Growing in the dooryard of her home, its edible tubers are important in the family diet.

PHOTO BY COVICH

visited had citrus trees of orange or lemon. Instead of making "lemonade" where a small amount of sugar is added to lemon juice, they reversed the process and added just a bit of lemon to their cane squeezings.

Papayas, mangoes, pineapples, avocados and mammey were among the various tropical fruits which were grown by the Indians but were not very abundant. The Indians seem to derive the little variety they have in their menus from plants growing about the house clearing. The plants blend in so well with encroaching wild vegetation that one many times had to ask the Indians which plants were used and which were "weeds." In many areas it is thought that our domesticated plants were evolved from wild "weeds" which man slowly found to be useful. It is strange to note, however, that in the tropics there are very few edible plants in the wild and many are quite poisonous. Thus, primitive man has not had many types of plants to cultivate and his diet had been almost wholly centered on the little game or fish he could find and on very few plants. Perhaps corn, beans and squash were the most widespread and made up 90% of his diet. In more recent times the Indians have adopted many introduced plants just as we have in our diet. The Indians, in fact, do such a good job of adapting these introduced plants and inventions that one could easily think they have always used them. The outboard motor is an exception that stands out easily.

Other plants were found growing about the clearing which were used as ornamentals and as medicines. The most common one was the "Buenas Tardes" ("good afternoon") or "Four O'clock" (*Mirabilis jalapa* L.) which occupied a prominent place in over half of the sites. This stout herb is believed to be of American origin but is not found in the wild state. The use of "Botochillo" *(Spilanthes ocymifolia)* was noted to be helpful in numbing the gums by chewing the stems of this weedy composite. Its effect lasted for ten or fifteen minutes before more had to be chewed to stop a toothache. The Indians are known for painting their bodies from chin to ankles or in some design. The plants used are "jagua" *(Genipa americana)*, a deep purple stain, and "achiote" *(Bixa orellana)*, the yellow-orange annotto dye of commerce. This latter dye has been used to color butter and cheese in modern times. Today the Indians use the seed coats to color their soups and occasionally rice as well as their faces. We have adopted this shrub as an ornamental in Florida, sold under the name of "Lipstick Tree."

Perhaps one now has the impression of Rousseau's noble savage. It cannot be stated objectively that the Choco Indians are worse off than Americans or better off either. They appear very happy and carefree and the visitor can hardly help being a bit envious. The children are outwardly shown expressions of affection by both parents at every opportunity, yet the children usually are quite well behaved. I doubt if there are many Choco who would want to trade places with me.

* * *

BOOK REVIEWS

Geoffrey Grigson. ***A Herbal of All Sorts.*** With 4 plates and 19 illustrations (mostly reproductions of old wood-cuts). 96 pages (including 4 reserved for notes). Macmillan, N. Y. 1939. $2.50.

THIS is a kind of illustrated notebook about European plants, some very common, some quite rare, most of them used for medicine or food or ornament or magic at one time or another. The items vary in length from short paragraphs to a page or two. There is a note on the practicality of glue made from the bulbs of English Bluebells, a short paragraph on plants that grow in churchyards, and another on the fragrance of the smoke when an old lilac is cut up and used for fireplace fuel.

The pickled capers which we buy for sauces, salads, and appetizers are the flower buds of a spiny shrub, *Capparis spinosa,* which is native to the Mediterranean region. Grigson tells us that if the buds had not been picked they would have developed into striking and handsome flowers. The shrub frequently grows and blooms on old ruins and was one of the 420 kinds of plants found growing spontaneously on the Colosseum of Rome by Richard Deakin, M.D., and brought together by him in an illustrated book published in 1855. Grigson ends this note by telling of the caper flowers which blossomed on a wall bordering upon one of the Italian lakes. "There the only way to pick one for a favourite girl was to swim."

And so on and on; there are in all 84 such entries. Probably no one reader is going to be delighted with all 84 but some things new and fascinating will be found by anyone interested in plants and their history. E.A.

Seaside Plants. Edwin A. Menninger. A Guide to Planning, Planting and Maintaining Salt-Resistant Gardens. 303 pages. 408 photographic plates in black and white, many of them full page. Hearthside Press Inc., 118 East 28th St., New York 16. 1964. $9.95.

SOME years ago one of the Menninger brothers of Topeka, Kansas, trained as a journalist rather than as a doctor like his brothers, moved to Florida as a newspaper editor. An enthusiastic gardener, he eventually became a nurseryman as well, and one of the world's outstanding authorities on flowering trees for the tropics. This led him to take a deep interest in the peculiar problems of gardening close to the seashore. Increasingly he came to see the problems of seaside gardening as worldwide in scope.

The book is largely an illustrated 200 page catalog of plant material for seaside gardens with short descriptions and brief comments. It ranges from the old reliables, through the "promising," to things worth trying if you can possibly get them. It is preceded by forty pages introducing the three "constant enemies" salt, sand, and wind and describing the garden problems created by their interaction. It is vividly written and should be required reading before buying, renting, (or even just touring) Florida gardens. It is so well written and condenses so much so effectively that gardeners and naturalists everywhere will find it interesting reading, whether or not they ever garden by the sea: "Wind is the arch enemy. Near the sea it can and often does, blow continuously and anything to stand up to it must have resistance or shelter * * * Only when it starts to play rough does it bring up its two deadly allies, sand and salt and these do the damage * * * The plants that stand up to this abuse on the beach are there in spite of the salt, not because they like it. * * * Salt is enemy enough but the sand borne by violent winds is worse. * * * in using the sand to blast and chisel, the wind tears the plants, dries them out, breaks branches, defoliates those it cannot cripple, and in many cases actually uproots the entire plant."

Beginning with the first chapter and continuing through the Appendix, "Proximity to the Sea" is graded: Belt I is right on the shore; Belt II is back a bit with slight protection; Belt III is well back with ample protection. Though the author thinks globally, his own experience has been in gardens just a little above sea level; except when he makes an effort he naturally thinks of gardens just in back of the beach. In reading such withering comments as the following quotations, one comes closer to realizing the kinds of experience Menninger himself has been through in twenty-five years just above sea level: If a gardener "lives high on a rocky shore where wind and wave cannot get at him very well, he can pretend to have solved the problem. He gets back from the shore several hundred feet and builds his 'garden' a couple of hundred feet higher than the water, where the sea's lash cannot reach him, where its cruel whip cannot kill, where his plants are hidden behind rock or cement walls, where he shields his home and living area with a shelter belt of trees."

The book is illustrated with excellent reproductions of 408 photographs, ranging from a few which cover entire pages, to a large number that are around two and a half by three inches. Though their prevailing tones are soft grays they are surprisingly sharp and many even among the smallest are full of significant detail. Most of them were apparently posed by experienced plant photographers; they are interestingly pictorial without losing any of their value as vouchers for the plants they depict. About thirty of them are views of landscapes or gardens along the shore. The latter are accompanied by detailed identifications of the species in each planting and will be of real help to earnest readers.

The discussions and illustrations of plant material are grouped in chapters on Ground Covers, Vines, Grass and Lily-like plants, Herbs, Shrubs, Trees, and Palms. Each of these is divided again into three sections according to the belt back from the shore for which the plant is best suited. In the descriptive matter plants are typified in a few words and related species or varieties are frequently mentioned. Along with the scientific name and common name, coded symbols present information about its availability in the trade, whether it is native to Florida or California, and its general frost hardiness. Pictures and text are seldom on the same page and not always under the same heading.

This format gives at times somewhat the effect of a book prepared by a computer but with help from the Index and the Appendix one can track down much useful information in a short time. A surprising number of incidental facts have been included. One learns for instance that the fruits of Geobalanus are so appreciated by land turtles and other short-legged animals "that it is often difficult to find one, even in a large colony of plants" * * * that if the vine of *Rhaphidophora aurea* ("Pothos") "grows upward, the leaves become enormous, frequently 1 × 3 feet; if it hangs down the leaves stay small, usually 3 to 4 inches long" * * * that the fancy-leaved Caladiums so frequently admired by Florida visitors "resist no wind or salt and the first storm destroys them, but they do make effective park beds for fair weather" * * * that the American thornless Honey-locust, *Gleditsia tricanthos inermis* is much more used for seaside planting in Australia than in its native land.

The book closes with a fifty page Appendix. It has references and a four page summary on salt tolerance. Its title (in large capitals) is an amusing witness to hasty editing: "SOIL TOLERANCE IN SOILS." There are twelve pages for quick visual reference where all the genera described in the book are roughly classified in three grades of cold hardiness and three of salt resistance. This certainly means very little for a large genus whose species differ in these reactions. There are two pages listing commercial nurseries in this country and abroad which can supply *some* of the plant material. A two-page table lists, plate by plate, the pictures which were supplied by various photographers around the world. From this I estimate that the author himself took about 75 of the 408 in the book. There is a bibliography of the 49 books, principal articles, and check lists referred to in the text. There is a 19 page double-column index to plants by common name and generic name. It is unsatisfactory for large genera like Agave but anything more detailed is probably too much to ask.

Some niceties of botanical editing are ignored. *Echites echites*, a type of scientific name long since ruled out by international agreement, is chosen for a heading rather than one of its synonyms. In extreme instances it is difficult to determine how many species of plants the author is presenting in an illustration and the descriptive text.

But these are relatively minor matters. A great deal of pertinent material has been brought together in an attractive format. The book is large enough to display the full page plates effectively, but small enough to lie comfortably in the hand when turning the pages. The author has thought about the problem as a whole even though his feelings are closely tied to his long experience in southern Florida. Hard won first hand observation allows the author to insert appropriate details here and there throughout the book. He has given future authors something to build on, particularly those who disagree with some of his judgments or resent some of his omissions. E.A.

The Origin and Cultivation of Shade and Ornamental Trees, by Hui-Linn Li. 282 pp., 90 text figures. University of Pennsylvania Press, 1963. $6.00.

In 1956 there began to appear in the Morris Arboretum *Bulletin* a series of scholarly articles by Dr. Li on the origin and history of some of our outstanding ornamental trees. The first 190 pages of this volume are essentially reprints of these articles. Shade trees not dealt with there are gone through briefly in the next forty pages. Three short concluding chapters compare Europe, Central Asia, Eastern Asia, and North America as centers of origin of cultivated trees.

The treatment of various trees is therefore uneven. The oaks of the world are summarized in a little over half a page, the birches in less than that, while the ginkgo takes up 26 pages. This chapter is the finest in the book. It breaks new ground and reviews all the literature, Oriental and Western. In it Dr. Li calls on his special endowments, his personal knowledge of the flora of eastern Asia, his familiarity with Chinese literature, including the Chinese Classics, his detailed acquaintance with public and private gardens in Greater Philadelphia, and his ability as a botanical artist. The result challenges all the experts and makes a convincing brief for Dr. Li's own conclusions.

Dr. Li's investigation of the ginkgo's history as a cultivated plant, fitting together evidence from various sources, has almost the fascination of a detective story. The Chinese Classics go back three thousand years. For the first two thousand years there are no certain references to the ginkgo, therefore it is unlikely that it was taken over and actively spread by the Buddhists in early times as various authorities have supposed.

It was not until in the Sung dynasty (Chinese people and Chinese culture began to move southward under pressure from the Tartars to the north) that definite information begins to appear in the record. The seeds as a rare and precious fruit were then being sent from the ginkgo's native region in eastern China, south of the Yangtze River, as annual tribute to the emperor. Another book tells of Prince Li Wen-ho having successfully transplanted ginkgo trees from the South and that it gradually was propagated and multiplied in the North until fruits were no longer precious.

The Sung dynasty was a period of great artistic and literary activity. Some of the most detailed evidence comes from an interchange of poems between two famous poets, both holding official positions in the capital. Ou-yang (1007–1072 A. D.), with a reputation as a historian and essayist as well as a poet, sent some of the precious nuts from Prince Li's trees to Mei (1002–1060 A. D.) who himself came from southern Anhwei province. This was the very region from which the original ginkgo nuts had been sent in tribute to the emperor. It is also precisely the place where Frank Meyer, the great botanical explorer of the U.S.D.A., found apparently wild-growing ginkgoes in the early nineteen hundreds in such quantity that they were being cut for firewood. In thanks for the gift, Mei wrote a poem in return. He used for the ginkgo the southern name "duck's foot" (in allusion to the shape of the leaves) and expressed his delight that this tree from his native home was being honored in the capital. With this, the historian in Ou-yang became active and he wrote another poem to record the facts for posterity. The following is somewhat condensed from Dr. Li's translation:

"*Ya chio* (duck's foot) grows in Kiangnan, with a name which is not appropriate. At first it came in silk bags as a tribute, and as *yin hsing* (silver apricot, the 'literary' Chinese name for the ginkgo) it became cherished in the middle provinces. The curiosity and effort of the noble Prince brought roots from afar to bear fruit in the capital. When the trees first fruited they bore only three or four nuts. These were presented to the throne in a golden bowl. The nobility and high ministry did not recognize them and the emperor bestowed a hundred ounces of gold. Now, after a few years the trees bear more fruits. The friendly owner presents me with these nuts like giving me pearls. Someone should record the beginning so that future generations can know its origin. This is not only continuing your verse, but also contributing to history."

Li then goes on to show how in the Yuan dynasty (1280–1386) the ginkgo came into the herbals and the medical books. In this whole consistent record there is no mention of any association with Buddhism as claimed by E. H. Wilson. Furthermore the Anhwei-Chekiang borderland is the home of other rare species and genera. Ginkgo is not the only relict in the area. Significantly it was from the adjacent Chuki district that there have been recorded a number of named varieties of ginkgo, cultivated for their nuts.

No one piece of Li's evidence is decisive but it all fits together consistently. He has patiently built up a thousand year detailed story. Now that the Dawn Redwood, long known only as a fossil, has been found alive in another back corner of China, the botanical world will be more ready to accept the evidence than when Meyer reported his discoveries. E.A.

COMING SHOWS IN THE FLORAL DISPLAY HOUSE

September 5–13
Henry Shaw Cactus Society Show
September 19–20
Harvest Show of the Regional Council of Men's Garden Clubs
September 26–27–28
Dahlia Show
October 17–18
Allied Florists
November 1–29
Chrysanthemum Show
December 6–January 10
Poinsettia Show

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SATURDAY MORNING NATURAL SCIENCE PROGRAMS FOR CHILDREN

Time: 10:00 to 11:30 A. M.

Place: Shaw's Garden Museum Building or Research Greenhouse.

SEPTEMBER

5 "The Mighty Oaks." Make collection of important species to take home.

12 "The Hundred-in-One Flower." Study early fall flowers belonging to Sunflower family.

19 "Devil's Footstools." Mushroom demonstration including story of penicillin.

26 "Plants with Split Personalities." Story of plants known as Lichens. Take home samples.

OCTOBER

3 "Planting Bulbs." Paperwhite narcissus bulbs planted to take home. (Bring a 1 lb. coffee container.)

10 "Fall Treasure Hunt." Field trip in Garden. Contest and prizes for solving riddles and trail finding.

17 "Fall Colors." Draw or paint scenes in Fall color.

24 "The Forests of the Rocky Mountains." A travelogue illustrated with slides.

31 "Nature Movies." Three color-sound movie films.

HORTICULTURAL COURSES FOR ADULTS

THE fees charged in these courses include all the necessary material. Registration must be made in advance, since the number of persons who can be accommodated for each session is limited. Phone TOwnsend 5-0440 or write "Horticultural Courses, Missouri Botanical Garden, St. Louis 10."

Plants Under Artificial Light

The Class will meet in the Orchid Greenhouse in the rear of the Plant Display House.

The latest theories and practice on the use of artificial light in plant propagation and culture in the home, the small greenhouse, or by the commercial grower.

1 Session—Fee $5.00. Orchid Greenhouse. Saturday 10 A. M. to 3 P. M. October 10.

Instructor: Mr. Robert J. Gillespie.

* * *

How To Propagate From Cuttings

Fundamental facts and procedures of producing trees, shrubs, and perennials from cuttings (asexual reproduction). The Garden will supply a plastic-covered metal propagating flat, propagating media, and plant materials for 40 to 50 kinds of plants. Student practice will emphasize propagation of house plants such as begonias, dieffenbachias, and philodendrons. Some attention will also be given to hardwood cuttings. The following methods of vegetative propagation will be used: root cuttings, suckers, divisions, hard and softwood stem divisions, hard and softwood stem cuttings, leaf, bud and scale cuttings.

5 Sessions—Fee $12.00. Experimental Greenhouse.

Tuesday Evenings—8 to 9:30 P. M. October 13, 20, 27, November 3, 10.

Thursday Afternoons—1 to 2:30 P. M. October 15, 22, 29, November 5, 12.

Instructors: Mr. Clarence Barbre, Mr. Kenneth Peck.

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George B. Van Schaack, Librarian and Curator of Grasses

Trifon von Schrenk, Associate Curator of the Museum

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's from 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 9:00 P. M. and on Saturdays, April through October, as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

October 1964
Volume LII
Number 8

COVER: The Hardy Orange, *Poncirus trifoliata*, in fruit at Gray Summit, Missouri. The interesting specimen near the Linnaean House about which Mrs. Shepherd has written so feelingly, finally had to be removed. Its vicious thorns were too close to a walk used by many of our visitors. However it did permit the Garden to claim quite honestly that it had flowered and fruited oranges out-of-doors in St. Louis.

PHOTO BY PAUL A. KOHL

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LII No. 8 October 1964

THE HARDY ORANGE

ONCE upon a time there was a forbidden tree in another Garden and I thought of that as I gazed at *Poncirus trifoliata* situated at the northeast corner of the Linnaean Garden. I was told the fruit is not palatable and I could see the thorns were vicious looking. In spite of that however the beauty of its shiny green foliage fascinated me. I saw this lovely plant creation again out at Gray Summit where the oldest specimen we have was received from the government around 1926. It was planted on the north end of the northeast Orchid House. It proved absolutely hardy, being somewhat protected in winter by the Orchid House itself. It has annually produced an abundance of orange-scented flowers similar to other orange blossoms and at the time of my observation of the plant during the Friends of the Garden picnic, the bees evidently did a wonderful job of pollination in view of the quantity of fruit.

The Hardy Orange, as it is commonly called, could hold its own in any beauty contest even along with exotic and other tropical plants. *Poncirus trifoliata,* sometimes known as *Citrus trifoliata,* is the "hardiest of all the citrus fruits, and is used as grafting stock for the more tender citrus fruits."

Native of China, it is natural then that it should be used for artistic arrangements in the fall with the small orange-lemon colored miniature fruit so much like the orange and smelling so strongly like the orange. After the fruit has dropped, the spiny growths can be used for attaching ornaments or candies. Early spring attaches the lovely shiny leaves and fragrant flowers which are so lovely as bouquet fillers or as an arrangement itself. In Japan, as well as parts of the United States, it is used as a hedge and a very definite hedge it can be as an impenetrable barrier.

Plants grow very easily from seed when sown in the fall. Young plants were brought into town and grown successfully in the Garden as well as other locations. When planting it is suggested that it be located away from children due to the prominent two inch thorns, which can be very dangerous.

"Be careful when you touch me; don't eat me; other than that you can enjoy me."

MABEL SHEPHERD

A TIMELY GIFT

During mid-August the deafening tattoo of a pneumatic drill shook the Garden for a fortnight. The solid but unsightly walls of the old Palm House were being reduced to rubble and carted away by truck. This was only the first step in eliminating the all too noticeable eyesores on either side of the Climatron. This refurbishing is being made possible by a check for $14,936.96 presented to the Garden on the 23rd of last June by the President of the Women's Association, Mrs. George Pettus. The bulk of the money (around $12,000) came from THROUGH THE GARDEN GATE, the sale and exposition carried on under the chairmanship of Mrs. Edwin Stuessie by her resourceful and devoted staff.

The twin scars on the landscape were a necessary part of building the Climatron. When the old Palm House was torn down, its two westward wings, (the Desert House to the left and the African Succulent House to the right) were kept with their collections intact. The actual connections to the main building were sealed up with plaster-board but no changes were made in the framework and long stretches of the foundation were left in place.

Between them these two greenhouses make appropriate supplements to the collections in the Climatron. *It* displays the vegetation of the hot damp tropics and the warm damp sub-tropics; *they* show the dry sub-tropics in the Old World and the New. The Desert House with its mingling of succulents and desert shrubs has very much the appearance of the shrubby deserts of western Mexico. The African Succulent House has dramatic plantings of dry-country Euphorbias and masses of Aloes. The Euphorbias mimic giant cacti so effectively it is hard to realize they are close relatives of Poinsettias. The Aloes give a sort of moon-landscape effect much of the year and are strikingly handsome when they bloom.

The basal walls of the old greenhouse which more or less veiled these collections have been torn down and carted away. The foundations have been taken out to a depth of two feet underground and filled in with good soil so that there will be no strip of dead grass in hot summers.

Most of the work will be finished before the snow flies; one or two details will have to wait until next summer. The plaster-board is coming out, the strange curving peaks which joined on to the old Palm House are being removed and all the woodwork is being renewed. Wide new entrance walks which echo the curves of the Climatron, will take the public right up to the entrances. Base plantings of evergreens will help to tie the Climatron and its two attendant greenhouses into a more natural unit. Coming as it did immediately after the gift of new Lily Pools, the generous check from the Women's Association is helping in the transformation of these central features of the Garden. The hard work and devotion of many people make it possible.

THE BRACKEN IN THE GROVE
PTERIDIUM AQUILINUM

G. H. PRING

The story of the Bracken and its mysterious entrance into the Henry Shaw Grove dates from 1910. During the formative days of the Orchid Department Dr. William Trelease, first Director of the Garden, budgeted $100.00 annually for botanical Orchids. In April of that year, upon examining a shipment that I ordered from Sanders and Sons, St. Albans, England, I noted in one of the pots a young shoot extending from a Bracken rhizome which had been inadvertently left in the fibrous roots by the Orchid grower. This intrigued me as there was no Bracken represented in the Garden. I removed the rhizome with the attached shoot and immediately planted it in the Henry Shaw Grove inside the west fence, preparing a small peat bed for its home. This tiny stowaway-plant I carefully nurtured throughout the summer and by the end of the season the solitary shoot developed and was staked to prevent injury. I was particularly interested

The Bracken in the Grove in the summer of 1964 where it is spreading slowly through a ground cover of hardy ivy.

PHOTO BY PAUL A. KOHL

The English Bracken in the Mausoleum Grove as it appeared in 1941. It now not only covers a larger area but grows much higher.

PHOTO BY PAUL A. KOHL

to see if it would survive our sub-zero weather. I was thrilled to find this miracle of new growth the following spring, this tiny rhizome developing young shoots. For many years it was slow in establishing itself. It grew to quite a distance outside the fence. The U-shaped foot path on the inside of the fence, which is visible today, was added a number of years later and when it began working its way toward the center of the Grove its rhizomes persisted in growing underneath the path, appearing to have hopped across to the other side. The daily use of the path has kept the young shoots from developing. Today in the Grove this particular fern, ordinarily a rampant grower, will rise to 4 ft. and may be observed gracefully and graciously spreading its fronds on both sides of the iron fence, competing with the Bulgarian Ivy, both providing a perfect and delightful setting for the final resting place of Henry Shaw.

As a boy in the Orchid Department at Kew one of the many jobs I had was preparing the Bracken peat for Orchid potting. It was delivered in blocks about 18 × 12 × 6 inches cut from the Bracken Moors. The fibrous roots would be intermixed with the brownish rhizomes about as thick as the middle finger. The rhizomes were separated from the fibrous roots, the latter being used for potting of Orchids. The largest natural area (where it reached the height of 5 ft.) at Richmond Park near Kew Gardens was known as "Lovers Retreat."

The Bracken or Brake as it is sometimes called is a beautiful fern widely distributed throughout the world. It is native to Missouri and even reaches St. Louis County but usually in the eastern part of the United States it is scarcely knee high. In Oregon it may be found growing up to 6 ft. and in the Andes I have observed it growing even higher; in most cases it presents a profusion of lacy green fronds. In spring or early summer it is a delicate green rather resembling the Oak Fern but later in the season it becomes darker. It is mentioned in stories and poetry as making a comfortable open air mattress and the variety *esculenta* as a food in the form of cooked fern-root according to Dr. Thompson's "Story of New Zealand." The spreading frond has been compared to the plumage of an Eagle, which is suggested in the scientific name.

* * *

SACRED TREES AND SACRED FORESTS

EDGAR ANDERSON

A DEEP feeling of awe in the presence of certain trees may not be a universal human reaction but it has been shared by many people in many parts of the world from the earliest times to the present. When Buddha sat under the famous Bo tree and received his Enlightenment, the tree he sat under very probably was already a sacred tree, part of the ancient nature worship of India. One might reverse the usual statement about this particular specimen of *Ficus religiosa* and say not only is it sacred because he sat under it; he sat under it because it *was* sacred and an appropriate place to meditate.

Ancient sacred trees are still to be seen in India. One that I was shown at the edge of a village near Bangalore, apparently another species of Ficus, was a large round-topped tree with wide-spreading branches and broad evergreen leaves. Set close against the trunk were "snake stones," another survival of nature worship. They were small sculptured slabs, oddly reminisment of gravestones from a country churchyard in Vermont. Each portrayed a primitive deity, half snake, half woman. Though in that part of India there is need of every branch and twig, for fuel to cook with, the tree was unharmed. So completely has the ancient worship blended with those that came later, that small offerings of food are still sometimes left beneath the tree.

A few years later in Ethiopia I saw another old sacred tree which was still being venerated. It, too, was a large-leaved species of Ficus. It was in Galla territory between Jimma and Limu, a winding old road which had worn itself down into the landscape. The tree had stones piled around it in tribute and in spite of the fact that the passers-by were nominally either Muslims or Christians it was evident that the pile of stones was still growing actively.

A commoner sacred tree in that area was the beautiful *Podocarpus gracilior,* its dense, dark foliage similar to the Podocarpus branches which are now marketed nationally in this country at Christmas time for deluxe decorating. These tall trees made dramatic black green accents in the landscape. In the back country I saw one which had been used as a meeting place for the local court until a building was available.

Definite information about whole forests which were preserved inviolate because they were sacred is harder to come by. The most complete account I have come across is by the Assistant Director of Kew, Dr. N. L. Bor. Over two decades ago as the Botanist to the Indian Forest Research Institute he wrote about the ancient vegetation of Assam at the northeast corner of India. (*Indian Forest Records,* Vol. III, No. 6, pp. 159–162). The following excerpts are from his discussion of the sacred groves and what was happening to them in his time.

"THE SACRED GROVES OF THE KHASIS"

"The Imperial Gazetteer of India XV, 225 (1908) states with reference to the vegetation of the Khasi and Jaintia Hills: 'At an elevation of 3,000 feet the indigenous pine *(Pinus khasya)* predominates over all other vegetation, and forms almost pure pine forests. The highest peaks are clothed with clumps of oak, chestnut, magnolia, beech and other trees, which superstition has preserved from the axe of the wood cutter.'

"The above extract was written over 30 years ago and fortunately for students of plant life, superstition, or as some would have it, the grand old custom of the country, still preserves these clumps of evergreen forest. On the other hand, missionaries have been at work in these hills now for many years and the so-called superstition has begun to wane. It has always been a matter of great regret to me that the spread of Christianity in the hills tends to involve the complete destruction of all that is most interesting in the lives and customs of primitive peoples. It seems impossible to convert them to a new religion without divorcing them completely from all their customs, innocent and bad alike. . . .

"The maintenance of sacred groves is stated by Sir James Fraser (Golden Bough) to be an extremely ancient custom connected with tree worship. It is not known to me whether the Khasis worship trees at the present day but they do maintain sacred groves."

"The pagan Khasi regards these groves as the abode of his tribal gods and is forbidden by tribal custom to fell, lop or damage a tree in any way; no flower may be plucked, no fires lit, no cattle grazed. He believes that the deity inhabiting the grove deals out punishment to those who break tribal custom in this respect."

"The alleged punishment inflicted by the spirit inhabitant of a sacred grove in the Khasi Hills has preserved the vegetation for many centuries but the outlook of the present day Khasi has altered considerably."

"The converted Khasi thinks it is a splendid thing to go into a sacred grove and cut a tree in order to defy the Gods of his fathers and to show his pagan brothers that their beliefs are all wrong. He does not realise, and his instructors do not realise, that the frequent result of such conduct is that the pagans grow up without any beliefs at all.

"The Khasi attitude of mind being what it is, it is unreasonable to expect that the sacred groves will last for ever. With their disappearance goes the last remnants of the climax forests of the Khasi Hills."

"Belief in sacred groves is, or used to be, a very potent factor in the preservation of patches of evergreen forest in the Khasi Hills, and to this belief do we owe the remains of the ancient covering of vegetation which has now almost disappeared."

A NEW STAFF MEMBER ARRIVES

The new Director of the Herbarium, Dr. Walter H. Lewis, arrived at the Garden early in September after two and a half years of intensive work in the Old World, most of it connected directly or indirectly with the Royal Botanic Gardens at Kew. During that time he traveled 14,000 miles in Africa in a Land-Rover, driving from Ethiopia and French Somaliland to Cape Town at the other end of the continent. Those who have spent even a few days in one of these seemingly indestructible vehicles on African highways and byways sometimes ache in the bones at the mere memory of the experience. Dr. Lewis says with a smile that stopping to make plant collections was always a delightful relief, even when the climate was like a steam bath and the vegetation thorny and intractable.

Dr. Lewis' professional career began at the University of British Columbia. As an Honors candidate for a B.A. degree in Biology and Botany he began a detailed study of the native roses of the Northwest. This developed into a Master's thesis at the same institution. He then carried his enlarging project (ideas, specimens, living plants) to the Blandy Farm of the University of Virginia. There he assembled a living collection of native North American rose species which is still in existence.

As a Du Pont Fellow at the University of Virginia, Dr. Lewis set out to study the classification and evolution of the roses native to North America, in the laboratory, the experimental garden, the library, and the herbarium. This became the subject of his Doctor's thesis there in 1957. Proceeding to Stephen F. Austin State College at Nacogdoches, Texas, as Assistant Professor of Biology, he carried his project along with him and has finished up this monographic study one part at a time. most of it has now been published, but though he began his work in the West, it is with the western groups of roses that he is still actively engaged. The first of these western studies is about ready for the editor. It deals with the Minutifoliae roses of the Southwest. They are to some people the most fascinating of all roses. One of the species in full flower looks at first glance like a slender-twigged, small-leaved desert shrub (certainly, it would seem, nothing to do with a rose) on which someone had pinned bright pink artificial roses.

At Nacogdoches he was soon advanced to an Associate Professorship. He also began to work with a local amateur rosarian at crossing native American roses with each other and with species from other parts of the world, a project which has already produced fascinating results.

Meanwhile he was beginnig to work his way into a far larger problem, the analysis of evolution and of systems of classification in groups which are native to both the Old World and the New. This is a problem which has attracted some of the world's greatest biologists but usually when they were too far along in their careers to get down to grips with it. In January 1962 with the help of a grant from the National Science Foundation he proceeded to Kew and used the Royal Botanic Gardens as his operating base. The second half of his visit was made possible by a Fellowship from the Guggenheim Foundation. He settled on three families of flowering plants to investigate. Finding that the newer detailed study of pollen had much to contribute to such a program, he worked at Professor Erdtman's "pollen laboratory" in Sweden to perfect himself in these techniques. In his long trip through Africa he collected vials of flower buds, expertly preserved for microscopic (and if necessary submicroscopic) examination, herbarium specimens, and fresh seeds. Many of the latter have already been grown at Kew and are beginning to yield their important details which fit into the whole interpretation. This work already opens up new insights into old problems and advances us toward new ideas which are now working themselves out.

Dr. Lewis is being brought to St. Louis by the Missouri Botanical Garden and by Washington University and will share his time equally between the two institutions. He plans, for the present at any rate, to work in St. Louis nine months of the year and to find other sponsors for three months of field work. At the Garden one of his first concerns will be to build up a comprehensive pollen collection, pollen grains of known origin permanently preserved on glass slides, systematically filed in small boxes, stacks and stacks of these in a few large steel cases. At the University he will teach the undergraduate and graduate courses in the Systematics of the Higher Plants (their classification and relationships) and carry on those phases of his research which fit in best over there.

E.A.

* * *

BOOK REVIEWS

Harold W. Rickett. 1963. ***The New Field Book of American Wild Flowers.*** pp. 414. 138 full page plates in black and white, 16 in full color. G. P. Putnam's Sons, N. Y. $4.95.

As compared with some other wild flower books this is really, as its name implies, a field book; it is just barely over an inch thick, binding and all, and small enough to fit into a man's coat pocket. All this in spite of the fact that it covers the area from Maine westward to include Minnesota, and southward to Virginia, the Ohio River and Missouri. By ingenious planning the more than 5000 species of flowering plants native to this area have been cut down to the 980 most likely to be encountered as wild flowers. Plants like grasses, sedges, and rushes whose flowers do not seem like flowers to the uninitiated, have been omitted as well as nearly all trees, shrubs and woody vines (you will, for instance, find nothing about the Redbud or the Trumpet Vine).

For the almost 1000 species which are included, nearly all are illustrated either by the author's small color photographs, or by black and white sketches, occasionally by both. The color plates are attractive and interesting to leaf through (particularly to one who knows the plants). They are taken at various scales, no indication of which is given in the book, so that the Orange Day-Lily and the tiny Yellow Stargrass, which are side by side, seem to be blooms of about the same size. The harbinger-of-spring, *Erigenia bulbosa,* known to many country children as "Pepper-and-salt" is illustrated by a handsome close-up, greatly enlarged, of the tiny flowers. The illustration would be recognized by very few of the naturalists and scientists who know the plant well in the field.

The black and white sketches are of uneven merit. They have been made in part from dried specimens in the herbarium; plants which change their appearance greatly as they dry do not come out very well. The common Ozark asters which are easily distinguished from fresh specimens could scarcely be recognized by one who knows them only in the field and the whole sunflower family, which takes up over fifty pages of the book, is rather unsatisfactorily provided for.

To guide the purchaser who is out in the field, using his book, Dr. Rickett has provided a series of keys to plant families and genera and species, though he has been honest enough to admit in print that on the whole it may be more effective just to turn the pages and study the illustrations. To the reviewer they are of doubtful value. Rickett admits they are so untechnical that "the professional, the specialist, will find much here with which he may not agree." On the other hand Rickett has spent a lifetime as a botanist and his own vocabulary is probably more technical that he now realizes. Nevertheless it is over twenty-five years since a popular Flora of Missouri was effectively illustrated by his photographs. It is a field of publication with whose peculiar problems he has long been familiar. The kind of simple, non-technical guide to wild flowers which even the intelligent novice thinks is just what he wants and should be able to find, is quite impossible. The living world around us is more varied than we ever dream until we start to examine it in detail.

EDGAR ANDERSON

A Flora of Southern Illinois. By Robert H. Mohlenbrock and John W. Voigt. Southern Illinois University Press, Carbondale, 1959. 390 pp., illus. $7.50.

THIS book, well organized as to content and handsomely printed on glossy paper, includes almost 1600 taxa—at the species level or lower—from 143 families of plants to be found in natural habitats in southern Illinois. As delimited by the authors, this region consists of the twelve counties to be found south of the 38th parallel, and laterally bounded by the Ohio and Mississippi rivers.

The introduction presents succinct but lucid descriptions of the twelve most characteristic habitats and accompanying plant communities in the area, as well as a helpful series of drawings of vegetative and floral features of plants repeatedly illustrated in the main body. Such a diversity of habitats, plant communities, and plant species within a relatively small area is evidently due to its central location in southern Illinois, where several major migration routes converge on a variable topography.

Identification of indigenous and introduced, though established, plants is made relatively easy by the system of keys presented. There is a key to sections based on convenient and useful groupings of families according to habit, habitat and broadly inclusive plant features. Each section similarly leads to families, where genera and their included synonymy can be found. Each entry named is cited as to habitat, flowering-time, and distribution, in addition to being certified by specimens in the Southern Illinois University Herbarium. After the keys to the sections, families are arranged in a modified sequence of the Englerian system.

It must be mentioned however that here, as is so often the case in the first edition of a flora, a certain number of technical errors exist in the keys that make it difficult to "get from here to there." For example, the flora lists *Arisaema*, *Peltandra*, and *Acorus* in the Araceae in the main body, although it is only possible to reach *Acorus* in the keys. Somewhat similar difficulties are encountered in trying to key out *Justicia* and *Dicliptera* in the Acanthaceae and *Oenonthera* in the Onagraceae.

Sixty-seven photographs are scattered through the text to aid in identification of plants and to illustrate striking habitats or plants with unusual features.

Of the total taxa listed, almost 200 are recorded from southern Illinois for the first time. The authors have made the interesting observation that Jackson County, the largest of the twelve in the region, is represented by 1363 taxa of the southern Illinois total of 1599, and that this county has 134 of the 143 families and 545 of the 601 genera named.

The book was written not only to serve local specialists in applied fields of biology, but to be used by anyone with a little botanical training who is interested in the flora of the region. The reviewer feels that the book will do this, and in addition, should help to demonstrate the significance of southern Illinois as a strategic location with soils and exposures variable enough to allow a considerable intermingling of plants from neighboring floras over short distances.

—ALBERT J. HENDRICKS
Southern Illinois University

* * *

"JEWELS OF OPAR," TALINUM PANICULATUM

SEVERAL years ago the BULLETIN called attention to this attractive and adaptable little annual from tropical America. In writing it up we used the common name "Pink Maids" which refers to the attractive small flowers of bright pink which open in the late afternoon.

This species has since been nationally advertised as "Jewels of Opar" on account of its seed pods which change color as they ripen, giving the branching flower clusters the appearance of being decorated with small colored beads. Both locally and nationally it is being increasingly used for "fillers" in arranging cut flowers, or dried for winter bouquets. E.A.

* * *

THE Chinese Witch Hazel *(Hamamelis mollis)*, just inside the Cleveland Avenue Gate, has had a long season of bloom in the Garden, this past winter. It began to flower in January, was in full bloom by the first week in February and stayed in almost perfect condition until the second week in March. When night temperature dropped below the upper twenties its long narrow petals hung down in the early morning as if they were badly damaged but they were upright again later in the day. As the weeks went on some of the red pigment of the calyx cup seemed to spread into the petals. They gradually deepened from a bright yellow into an orange yellow.

Now that this species is being offered for sale by more nurserymen it should be seen in more of our gardens. Wholly aside from its winter-blooming habit it is the most noteworthy of the witch hazels. Its flowers are much larger than any of the American species and are more brightly colored.

E. A.

◆

FALSE ALOE,
AGAVE VIRGINICA

THE summer of 1964 brought several inquiries to the Garden about this strange-looking plant. There are masses of it on the largest limestone glade (*not* the long narrow one) just southwest of the Trail House at the Arboretum. It is native in rocky places and in Missouri is found southwards from a line from St. Louis to the southwest corner of the state. Until it flowers it looks very much like what it is, a tiny relative of the large century plants of Mexico and the Southwest. Its small, waxy flowers are borne in slender wands one to two yards tall. The tubular flowers, about an inch long, are greenish white splashed with a dark pink-brown on the outside. They are dominated by large, lightly hung stamens, yellowish below, pale green or straw color above.

Out of doors the blossoms are disappointing to one who has watched the flowers develop for the first time, expecting something more like a tuberose. Displayed indoors against a neutral background, these flowering wands are dramatic in form and the subtle shadings of their color scheme are more apparent. They have no fragrance during the day, but Dr. Steyermark says that at night they smell like Easter lilies.

There is a form of *Agave virginica* with conspicuous blotches of purplish red on the leaves. In Missouri it and the one with plain green leaves can occur together or a whole patch of false aloes may be all one or the other.

False aloes are only one of the strange plants and animals on our glades which seemingly have originated as northern outliers from the long evolution of desert organisms in Mexico and the Southwest.

E.A.

◆

DR. JOHN DWYER of St. Louis University, Research Associate of the Garden, has been elected President of the Missouri Academy of Sciences. This institution brings together scientists from colleges, universities, and laboratories in the state of Missouri. One of its important functions is fostering more effective cooperation between scientists in different institutions.

Dr. Dwyer has just returned from a successful trip visiting herbaria and collecting specimens in South America and Central America.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's from 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 9:00 P. M. and on Saturdays, April through October, as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

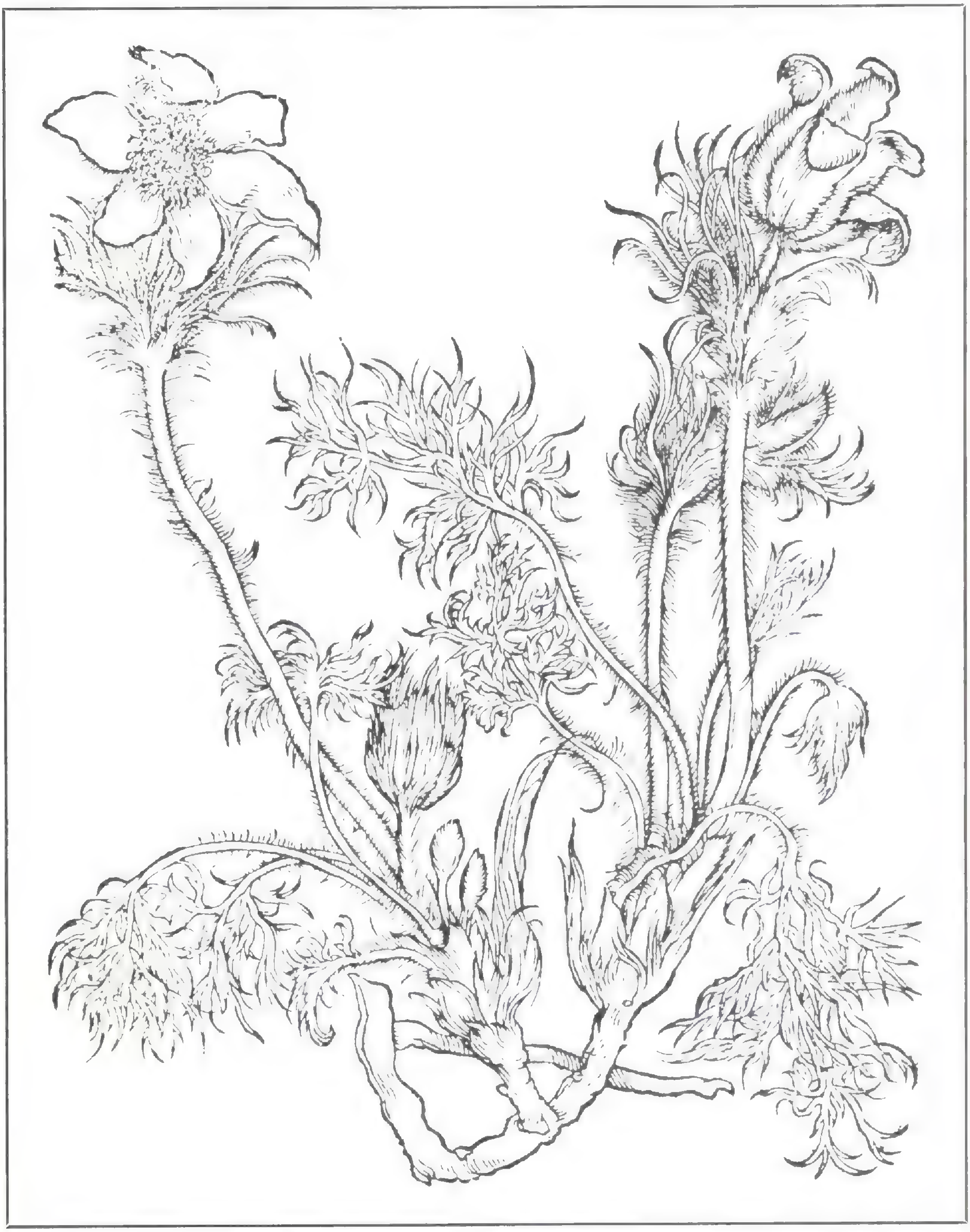
The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

November 1964
Volume LII
Number 9



COVER: Kuchenschell, from Otto Brunfels' *Herbarum vivae eicones*, 1530. The 16th-century name means 'cowbell,' but the plant, *Anemone pulsatilla* L., is nowadays more commonly known as the Pasque flower; it is shown here in its first lifelike representation by Hans Weiditz. Among the earliest of spring flowers, it is found in the meadows of the inland plains and lower valleys of Europe. A very similar plant, *Anemone patens* L., with the same common name, grows from northern Illinois to the West and on across the Canadian plains to Alaska in much the same kind of habitat.

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St. Louis Gardening

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LII No. 9 November 1964

AN EPILOGUE ON TWO EXHIBITIONS OF BOOKS

From June until September last summer the Garden was privileged to have fifty-six items from its library on display in the rare book room of the Olin Library of Washington University. With the title, 'Historic books and manuscripts, 1474–1874,' the exhibit was presented at the invitation of Dr. Andrew J. Eaton, Director of Libraries at Washington University, on the occasion of several national meetings of librarians. The rare book librarian of the University, Mr. William Matheson, and the Garden's librarian prepared a handlist for the exhibit of which the University generously published an edition of over 6000 copies. Several thousand of these were distributed to those attending the annual conference of the American Library Association.

The material was divided into six groups: rarities, illustrated books, Linnaeana, Americana, Engelmanniana and association copies. Quite naturally these groups could be expected to overlap; as a matter of fact, every piece could have been shown as a rarity, while practically all of the Engelmanniana, works by or otherwise associated with Dr. Engelmann, were also, thereby, association copies.

Included among the rarities was the Garden's oldest book, Crescenzi's *Opus ruralium commodorum.* This was printed in Louvain, Belgium, by John of Westphalia in 1474, less than twenty-five years after the first book was printed in the western world. Although nearly five hundred years old it has a rather modern flavor; it is a work on agriculture, written in the early fourteenth century, to instruct the inhabitants of northern Italy how better to cultivate their fields by the use of crop rotation, contour plowing, green-manuring and irrigation, for example. Another rarity was Oviedo y Valdés' *La historia general delas Indias* of 1535, a very rare work of which doubtfully ten copies still exist. Oviedo was sent by the Spanish crown on several missions to America in the first third of the century following Columbus' discovery. He traveled extensively in the West Indies, Mexico and South America, and, as an eyewitness, reports many novel observations.

Notable among the books selected for their illustrations was the so-called *Latin Herbarius*, printed in Mainz by Peter Schoeffer in 1484. It is the second printed botanical book containing illustrations; each plant is represented by a figure so stylized in most instances as to make identification almost impossible without the accompanying text and the Latin and German names by which it was known. Beside this book was placed Brunfels'

Herbarum vivae eicones [*Pictures of living plants*] of 1530. This is the first printed botanical work to be illustrated wholly by drawings made from living plants; the artist, Hans Weiditz, did so well that in almost every instance the specific identity of the plant represented is certain to one who knows it in nature.

The great Swedish scientist, Linnaeus (1707–1778), was first of all a botanist, although in his efforts to systematize the natural world he had to treat both minerals and animals as well as plants. But the bulk of his writings are on botany, and of these the Garden has a very excellent collection. Among the books in the exhibit was the first edition of his *Systema naturae* (1735); here, on twelve large broadside pages he displays in systematic order all of the larger groups of the three kingdoms of nature: mineral, vegetable and animal. He spent a large part of his life elaborating this system, and present-day taxonomists are still at work on it. Other works shown were first edition copies of his *Genera plantarum* (1737) and his *Species plantarum* (1753). In the latter, surely the most famous of all books in systematic botany, he first used, consistently for all plants, the now well-known system of binomial Latin names; in these, the first, like *Rosa*, is generic, the second, like *alba*, specific; the white rose of the Middle Ages is once and for all to be known as *Rosa alba*; to the plant scientist or horticulturist of *any* nation these two Latin words convey the same meaning. Few devices for international communication have been more effective in promoting learning.

Not least among Linnaeus' descriptive studies was himself. In 1741 he sought appointment to the position of botanist at Upsala University, opposed by an older and somewhat unscrupulous rival. To further his candidacy he published for private distribution a tiny volume of sixteen pages, *Orbis eruditi judicium de Caroli Linnaei scriptis* [*The judgment of the learned world regarding the writings of Carolus Linnaeus*]. In addition to his life's chronology—he was thirty-four years old—he lists his publications, already substantial in number, and gives copious commendatory quotations from learned people about them. Near the end of his life he wrote a most interesting volume, not published until a half century after his death, with the title *Egenhändiga anteckningar . . . om sig sjelf* [*Personal notes . . . about himself*]. Here are to be found a long chronological account, a list of publications (now very substantial), a description of his personal appearance, a list of his twenty-seven (numbered!) most important contributions to the learned world, and a much expanded section of commendatory quotations.

Dr. George Engelmann came to St. Louis in 1835, having studied medicine in his native Germany. During the next 50 years, in addition to being among the foremost physicians of the city, he was probably the outstanding resident scientist of the Mississippi Valley. By some he is thought to have been the most able 19th-century student of systematic botany in the United States.

He it was who was more responsible than anyone else for persuading Henry Shaw to establish the Missouri Botanical Garden, not as a display garden, basically, but as a scientific institution. It is doubtful there has been any activity in St. Louis which has been so widely known throughout the learned world at any time during the past century—at mention of the words 'St. Louis' or 'Missouri' in the biological scientific centers of the world it was more than likely to be the Missouri Botanical Garden which instantly came to mind. It was thus most appropriate that some twenty per cent of the exhibition should be devoted to Dr. Engelmann.

Here was the manuscript of his dissertation, *Über die Antholyse,* a study of abnormalities in flowers—in 1831 physicians were still required to have a first-hand knowledge of plants from which came many of their drugs. Here also was his personal copy of '*Cactaceae of the Boundary,*' his own account of the cacti found along the newly established boundary between Mexico and the United States. It is illustrated by Paul Roetter, a St. Louis lithographer, whose work compares most favorably with that of some of the great flower painters of Europe. Included also were three letters selected from the several thousand which came to the library at Dr. Engelmann's death—a world-wide correspondence with botanists, physicians, geologists, explorers, etc., during one of the notable periods of expansion in the knowledge of plant distribution.

Association copies—those signed by the author, or presented by him, owned or annotated by some famous man—make the bibliophile's heart skip a beat. The Missouri Botanical Garden library holds scores of association copies; two of those exhibited will serve for example. One was the second edition of Ermalao Barbaro's *Castigationes Plinii,* Venice, 1493-1494. This single volume ties together the names of three historic figures and fourteen centuries of time. First, Pliny, the great Roman compiler of natural history in the first century, A. D., so addicted to learning that he was almost never without someone reading to him or taking his dictation. Next, Ermalao, well among the first to question the correctness of what Pliny left us—here he claims to have set right five thousand errors. Finally, an early owner of the book, Hieronymous Emser, a clerical contemporary of Luther, in fact, one of his friends who at first supported him in his revolt against Rome, but who later joined the opposition to him and became the Pope's chief advocate against him. How can one even look upon this remnant of the past spanning fourteen centuries and involving two of the greatest controversies of the Renaissance, without feeling more deeply the unity of history and the continuity of man's search for knowledge and truth?

Less impressive, but much more charming, was John Lindley's *An outline of the first principles of botany* (1830), a small pocket-sized book inscribed: 'Mrs Lindley with the authors love June 1. 1830'—but not an ordinary copy, the four plates of illustrations not just engravings, but the author's original drawings—an intimate piece indeed!

On display in Edinburgh last summer was another exhibit of botanical books which invites comparison with our own, although its composition was very different. This was shown by the National Library of Scotland, in honor of the Tenth International Botanical Congress which convened during August; it traced the history of botanical illustration from the middle of the 17th century to the present. The entries numbered 105, of which 70 were printed books, the others being original drawings or paintings. The books were assembled from the library's own collection *and* from the collections of five other British libraries.

It would have been interesting, indeed, to see this exhibit, especially the original works. As for the printed books, however, I cannot feel overly disappointed about having had to miss this particular aspect of the Botanical Congress, for 80 per cent of these books are in the Missouri Botanical Garden library, only two of them incomplete copies! Among those missing from our collection are exceptional items to be sure, but at least half of them are either of quite recent vintage, 20th-century books, still available, or are more curious than important or beautiful.

A moment's reflection should prompt one to think about this ratio of 80 per cent. Is it unusual; if so, is it significant; and, if so again, how did it come about?

The answer to the first question is 'yes.' In fact, there are quite certainly no more than five other places in the Western Hemisphere where *any* 56 of the 70 books on exhibit are to be found in a single collection, or even in a single city; all of these are within the area of the thirteen original states of the Union. The answer to the second question is also 'yes'—the fact in question is significant. If these books were inconsequential and thus rare because they were not worth saving, or if they were odd pieces produced in very limited editions of a dozen or so, the significance would be small. But actually, many of them are among the gems of botanical illustration. To name just a few, here are Curtis' *Flora Londinensis*, of 1777–1798 with folio-sized engravings of flowering plants native to London; the same author's *Botanical Magazine*, begun in 1791 and still published in continuation—in it there are over 10,000 plates of ornamental plants introduced into cultivation in England; Sweet's *British flower garden*, 1823–1829, three volumes of very finely drawn and colored plates of plants from English gardens; Redouté's *Les Liliacées*, 1800–1816, eight volumes of folio plates, in printed stipple engraving, of lilies, irises, amaryllis, etc., among the author's finest work; van Rheede tot Draakestein's *Hortus Indicus Malabaricus*, 1678–1703, twelve volumes of folio plates of the plants of Malabar; Sibthorp's *Flora Graeca*, 1806–1840, ten volumes of folio plates reproduced from Ferdinand Bauer's exquisite drawings of plants of Greece; etc., etc. These and their fellows are the foundation stones of any great collection of botanical illustration as represented by flower prints.

But in another way the second question must be answered by 'yes.' Had the National Library of Scotland chosen for its exhibit books to represent early herbals from 1481 to 1600, or the botanical works of Linnaeus, or early American works on botany, or floras of Germany, etc., the ratio corresponding to the 80 per cent we are discussing would almost certainly not have fallen below 60 per cent and might well have reached 90 per cent, and the number of Western Hemisphere institutions likely to do as well or better would in no case have exceeded a half dozen.

We come to the third question: How did it come about that this unusual and significant library is here in St. Louis? To Henry Shaw, of course, credit is due for establishing and endowing the Garden, but he, himself, and even his friend and counselor, Dr. Engelmann, brought together only a very small part of this collection. It is rather to Dr. William Trelease, chosen by Henry Shaw to be the first director to follow himself, that the credit should go. Almost at once (1890) he founded the Garden's *Annual Report,* a publication largely of monographic content. This he used to establish a world-wide library exchange with learned societies; this continuing exchange has by now yielded at least 30,000 volumes of periodical publications for our library and has spread knowledge of the work done here over every continent.

But in other ways books gravitated to Dr. Trelease. Early in his directorship his friend, Dr. E. Lewis Sturtevant, a non-practicing physician of Framingham, Massachusetts, who was studying the history of cultivated plants and was making an important collection of books about them wrote him as follows:

> For some time past it has seemed to me that my library of early botanical literature would be more used at the Mo. Bot. Garden than elsewhere, as I cannot but believe that ultimately your institution will become interested in the history of plants, and their development. Now I leave home for Santa Fe, New Mexico, next month, under my Doctor's orders, which orders are sufficiently emphatic to justify me in attempting these little arrangements which can be done more certainly by one's self than by his executors. Now I propose that you forward to me at Santa Fe, after Nov. 17, a legal paper for signature, which shall give to the Mo. Bot. Garden, deliverable at my decease or sooner if I desire, my botanical library, including the scrap books of my writings and my notes on edible plants.

Needless to say Dr. Trelease was not backward about accepting this gift which contained several hundred volumes, including herbals from the 15th century onward, and which has formed a broad basis for the library's exceptional collection in botanical history.

Ten years later Dr. Trelease purchased a collection of similar size and content to supplement this; and throughout his directorship, which terminated in 1912, he spared no effort to fill in by purchase periodicals which he could not obtain by exchange, and the older monographic, illustrated, and historical works so easily and cheaply available at that time. Since 1912, although the library has greatly increased in size, in direction it has largely followed that set by Dr. Trelease. At the present time it numbers some 60,000 volumes and perhaps 100,000 pamphlets, and the cards on which the records of incoming serials are kept number about 900.

Every good story has a punch line. As soon as I had checked the listing of the Edinburgh show against our own holdings I began asking my friends what they thought the ratio of the Garden's collection to the books exhibited at Edinburgh might be. Most of them, of course, had, from time to time, been somewhat 'indoctrinated,' and their answers weren't too unrealistic. But one man's answer especially stands out. Upon my questioning him he said, "Well, . . . you couldn't possibly have ten of them, . . . I'll say five.' When I replied 'Fifty-six,' his instant rejoinder was, 'Well, then, you've been hiding your light under a bushel.'

George B. Van Schaack

BOOK REVIEW

Soil Survey of Daviess County, Missouri. Harold E. Grogger. USDA Soils Conservation Service in cooperation with the Missouri Agricultural Experiment Station. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

The soil maps of the United States Department of Agriculture are known by relatively few of the people whom they might interest in one way or another, in addition to the farmers and soils experts for whom they were primarily designed. They contain much basic information. One can imagine this survey of Daviess County in northwestern Missouri being helpful in some technical connection, to engineers, gardeners, school teachers, naturalists, sociologists, and historians.

For decades these reports were published as large multicolored maps which were difficult to consult and to compare with the accompanying text. Progressive changes have made them into attractive brochures which can be read and studied in a comfortable arm chair. This has unfortunately not made them easier to file safely on a library shelf. The survey of Daviess County is about 11 × 9 inches with a flexible paper cover; as something to sit down and read it is roughly about like one issue of the *Atlantic Monthly* or of *Good Housekeeping*.

The bulk of the survey is a series of 34 maps each of which is about a foot and one-half long when unfolded. The maps were made directly from airplane photographs which show the county in light and dark grays as it looks directly from above, fields, pastures, fencelines, woodlands and rivers. Sometimes there are graphic indications of how a pasture is being destroyed by gullying or filled up with brush and high weeds. Enough land in Daviess County is under grass to make its drainage patterns stand out clearly on the map. One sees how trees and bushes tend to line all the watercourses from the biggest rivers to little depressions which carry water only after a rain.

Against the shadowy background of the photograph, houses, churches, roads, railroads, etc., are printed in jet black as well as a detailed distribution for the whole county of all the soil types and subtypes; wavy outlines which run continuously across fields, pastures, and woodlands, their curves a secondary reflection of the rolling prairie landscape.

There are a few introductory pages explaining how soil surveys are made and something of what they indicate. There is in particular a clear diagrammatic drawing of two landscapes showing distributions and relationships of the various soil types above and below ground. There are descriptions and discussions of each soil type with tables showing its suitability for various crops. There is for engineers a summary outlining, soil type by soil type, such basic features as soil texture, permiability, and the depth to hard rock, etc., conditions which affect the construction and maintenance of buildings, roads, airports and the like.

For an occasional reader with an inquiring mind (and the drive to find out just what he can make out of such a document) this publication may be fascinating just in itself. It does bring together for handy reference a great variety of integrated facts about a small piece of the earth's mantle and its history.

EDGAR ANDERSON

CHINESE GOOSEBERRY, NEW ZEALAND GOOSEBERRY, OR KIWI FRUIT

LAST month Dr. Edgar Anderson purchased an unusual fruit, labeled "kiwi fruit," in a Bettendorf-Rapp supermarket. When I was in Edinburgh last August to attend the International Botanical Congress, the same kind of fruit, labeled "New Zealand gooseberry," was sold in a fancy fruit market. Several English and American botanists did not know what it was and, with only the fruit and the clues given by "Kiwi" and "New Zealand," it could not be identified by using the usual texts on fruits and cultivated plants or our books on the flora of New Zealand.

The fruit (Figure 1) is about two and a half inches long, an inch in diameter, and covered with a thin, leathery, brown and hairy skin. At the stem end are the remnants of the sepals and at the other end is a small depression marking the stigma. The flesh is green and translucent with numerous very small black seeds which, when viewed with a magnifying glass, are seen to be regularly marked like the much larger seeds of many of the passion fruits.

The flavor and texture are pleasant but difficult to describe. The fruit combines the freshness of a strawberry with the bland flavor and texture of a ripe green fig. The taste is far superior to that of any gooseberry I have eaten. Signs on the fruit in both St. Louis and Edinburgh suggested that it could be eaten raw or cooked. I prefer the fruit raw, in a fruit salad. At present the fruit is too expensive (at two for 29 cents) to consider using many, but it would be a good pie fruit if the price drops.

Dr. David Fairchild collected useful plants in many parts of the world and mentions many unusual fruits in his articles and books. It seemed likely that he would have mentioned so curious and tasty a fruit so I went through a list of his works and found a little pamphlet he had written in 1913 on some Asiatic vines of the genus *Actinidia.* In this he pictured the Chinese gooseberry, or, to give the English version of the Chinese name, the Yang-taw, *Actinidia chinensis.* There apparently are many kinds growing in China and Korea with widely varying qualities. In one photograph Dr. Fairchild shows a vigorous vine climbing a trellis near Washington, D. C. There the vines were killed back to the ground each winter but grew so rapidly the following year that they produced a good cover before July.

The first plants to grow and flower in the United States and in Britain were from seeds sent back by Mr. E. H. Wilson, then a collector for Kew Gardens and later on the staff of the Arnold Arboretum of Harvard University. The Missouri Botanical Garden herbarium contains a specimen collected by Mr. Wilson on one of his early trips in western Szechuan province, China.

In a recent survey of economic plant products, published by the Royal Botanic Gardens, Kew, Dr. F. N. Howes says that about 300 tons of the Chinese gooseberry are grown each year in New Zealand and the amount will double when new plantings come into bearing. There are several named varieties, but most of the fruit shipped to Britain is the Abbot variety. The fruit keeps and ships well and it is likely we will see more of it in our markets. Attempts were made to introduce the Chinese gooseberry into southern gardens many years ago and it was listed by some nurserymen. The 6th edition of Plant Buyer's Guide lists 5 dealers who handle *Actinidia chinensis.* In some of the early catalogs and in Bailey's Manual of Cultivated Plants it is called *Yangtao,* another version of its Chinese name.

Several other Actinidias have been tried in this country. One of the most interesting is *Actinidia polygama,* usually called the silver-vine because when it gets of flowering age some of the leaves are silvery-white or marked with silvery areas. A plant growing in the Arnold Arboretum attracted so many cats that a wire cage had to be constructed about it and even then cats struggled so hard to get to the twigs and leaves that they bent the netting and left hairs sticking to it. A resident of northern Japan told Dr. Anderson that hunters gather the vines of this or a similar species, crush them and throw them on hot coals. They wait in the forest and shoot the wild cats which are attracted. This species and several others are sold by a few nurserymen. If you are interested in trying these plants and your own nurseryman cannot locate sources, you may call our Information Center any weekday morning and we will give you the listings contained in the last edition of Plant Buyer's Guide.

HUGH CUTLER

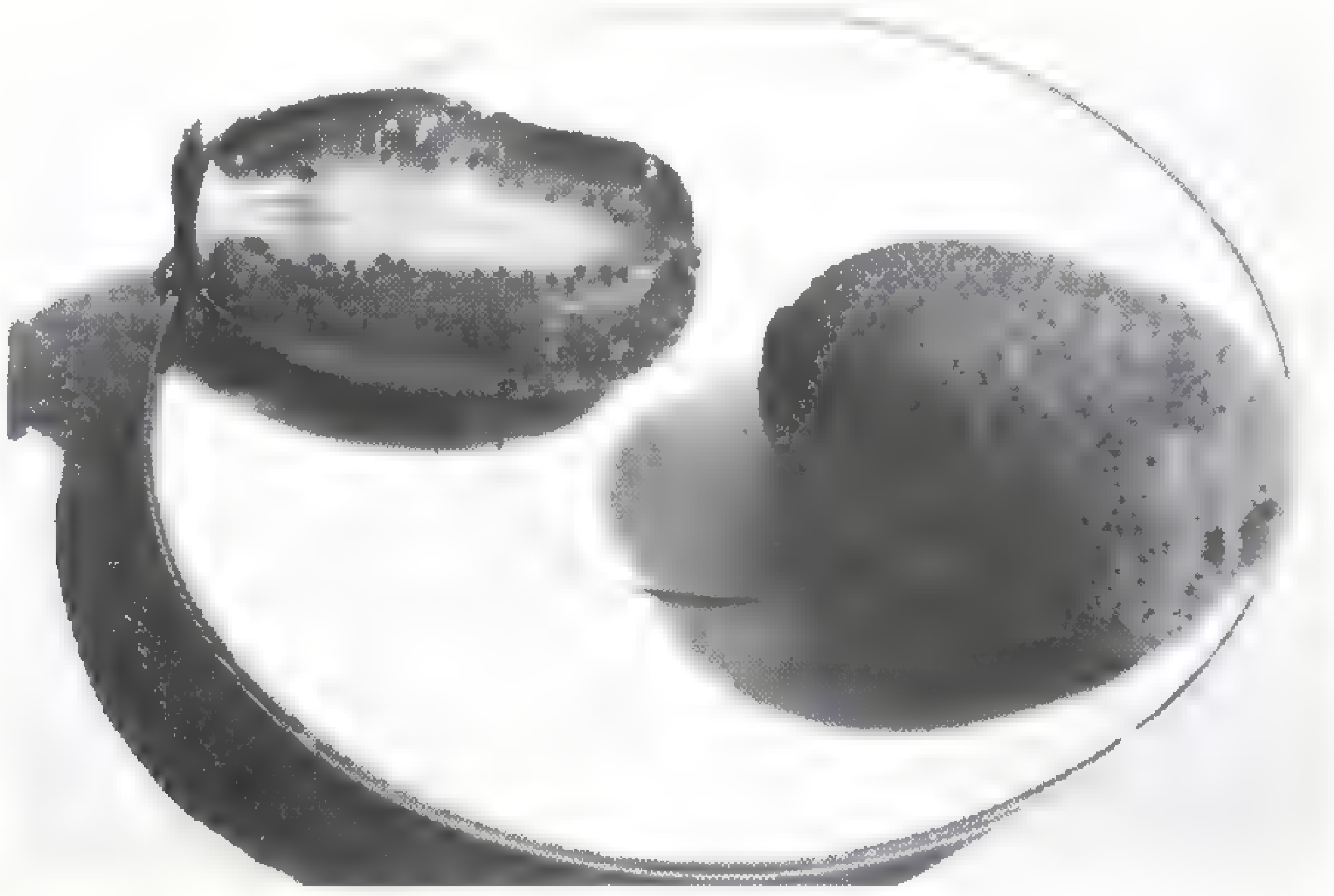

FIGURE 1

Two Kiwi fruits on a large coffee saucer. The one to the left has been sliced in half lengthwise and shows the translucent jelly-like pulp and shiny seeds.

PHOTO BY HUGH C. CUTLER

THE PITZMAN NATURE PROGRAM — 1964

THE seventh Pitzman Nature Program was given this summer. As in the past, it was financed by a grant from the Pitzman Foundation. Even though registrations were limited this year to 200 children per section, attendance did not suffer. The total registrations mounted to 554 and a record number of 451 children were eligible for certificates. The morale of the program, both on the part of the instructors and the children, was higher than it has ever been and remained high throughout the summer.

There were again two identical 5-week sessions with sections meeting on Tuesday-Thursday and Wednesday-Friday. No changes were made in the courses offered although there were two new instructors, a situation which always adds something to the program. The St. Louis Audubon Society, with Mr. Earl Hath as its president, provided another good course in bird study. A number of experienced and reliable bird instructors, Mrs. Cecil R. Criger, Miss Sarah Owen, and Michael Flieg were the backbone of the bird classes all summer. They were assisted by William Brush, Lee Thallman, and Misses Carolyn Reynolds and Saundra Dexter. It is gratifying to know that the Audubon workers have freely volunteered their services over the years and we owe them a great deal of thanks.

The Garden's teaching staff consisted of Jean Bardenheier, a student at St. Louis University; Fred Bardenheier and Veronica Friel, high school seniors; and Nancy Keller and Frances Eisenhauer, seniors at the University of Missouri and Washington University, respectively. Assisting in numerous capacities in support of the instructors and the classes were Bill Eickmeier, Edwin Joern, Alan Meyers, and Barney O'Meara. These young men kept the supply line of materials flowing and gave the program the extra legs necessary for a smooth operation. In addition, they supervised children during lunch hour and on field trips and kept the class areas carefully groomed and free of litter. All but two on the Garden's summer staff were former students in the Pitzman Program.

Class activities were many and varied. In *Trailfinders*, some groups made plaster casts of leaves and many children made impressive, labeled leaf collections. In the *Man's Enemies* groups, the making of insect nets was a major activity to say nothing about the many insects that were chased, caught, and mounted. The *Plants and Man* classes made seed collections and had exercises in plant propagation and flower identification. Field trips on the grounds and to the Climatron were, of course, taken frequently.

Each 5-week session was ended with a competitive 90 minute treasure hunt, an activity which is now a customary procedure. Prizes were given to teams with the largest finds. From a list of some 50 items, children had for instance to find an edible plant, a weed, a parasitic animal, or a specimen of the world's smallest flowering plant.

One of the highlights of the past two summers was the "Candy Lady." This name was affectionately given to Mrs. Frank Vesser, who, at lunchtime, would bring out two baskets of assorted penny candies from the Tower Grove Shop. Children eagerly, if not impatiently, awaited her arrival in the lunch area. It is amazing to see that a child can still get a fist full of candy for just a few pennies. Many thanks to Mrs. Vesser for her thoughtful and popular idea.

Something that we who were involved with the program were thankful for was that there were no serious injuries to any child all summer long. There were the usual small cuts and scrapes but no one required the services of a doctor.

In summary, it may be said that this past summer was a very successful one. While no attendance records were established, we had the opportunity to share the wonders of nature with a goodly number of eager children.

KENNETH PECK

A BICENTENNIAL OF GARDENING IN ST. LOUIS

LIKE any other aspect of culture, gardening doesn't transplant easily from one country to another or even from one region to another. Like the very plants with which it deals, it has to be adapted to the local climate and the local soils; it has gradually to fit into the way of life of the local residents. Gardening itself has to grow, and this takes time.

Much of it grows just by passing on seeds, plants, and ideas from neighbor to neighbor. Someone finds a variety that fits in well here; someone else has a bright idea about a new way of growing an old plant. It is these little unrecorded discoveries which spread from house to house and from neighborhood to neighborhood that mean the most when we look back over the progress made in two centuries.

I was thinking of this whole process one September day when a series of errands took me to different places in the Botanical Garden and to different parts of St. Louis. On that day decorations in Mr. Shaw's house featured crepe myrtles and I saw the same variety (sometimes at several houses in a block) in different parts of the city. In St. Louis they don't grow higher than the house as they can in the South; we never have charming old bushes or trees of them which are handsome even in the wintertime, just for their bare outlines, as at Williamsburg. But many St. Louisans are learning what one can and can't do with crepe myrtles here. Frequently now we get magnificent results with little effort.

It wasn't always so. When I came to St. Louis in the early twenties I had lived here several years before I saw *any* crepe myrtles in bloom. Then one September morning a man came to the suburban train at Webster Groves proudly bearing several fine sprays of them for his office. The shining leaves, something like privet but larger, set off masses of brilliant blooms with petals like delicately crinkled pink tissue paper. I rode into town with this gentleman and he told how he had moved here from the South and tried to grow crepe myrtles and they froze back. He kept on trying and learned that by planting them close to the house they didn't freeze back so completely and that if they were on the south side they got enough of the heat they love, to flower in the late summer. In other words in St. Louis he thought they needed to be treated something like Buddleias. I didn't learn this man's name but he (and others like him) were the centers from which the idea spread.

In the early thirties Paul Kohl of the Garden staff became interested in a specimen bush of crepe myrtle that did well for several years at the intersection of Gurney Court and Magnolia Avenue. A few years later he planted a row of them along the south side of the Linnaean House where they have made a good summer and early autumn display ever since. He believes they have done so particularly well there because the heating pipes for the building run along the base of the wall under the windows and the ground temperatures are modified more than by an ordinary building. In about ten years, after a series of mild winters, these plants developed into good-sized bushes and for a time gave almost the effect of flowering trees, as crepe myrtles do in the South.

When colder winters returned to

St. Louis these plants were frozen back but they sprouted out vigorously and made attractive flowering branches the next summer. Mr. Kohl has learned that we are apt to get more effective displays after a severe freeze-back than after a slight one. If the bush is only slightly injured it sprouts out all over and makes many small branches. When killed back farther down, the growth energy goes into a few big branches and we have larger and denser masses of bloom.

So far as we know, all of the bushes which have done well in St. Louis gardens are of the old variety "Watermelon Pink." Old varieties of plants sometimes develop sub-strains and it is possible that this may have happened with "Watermelon Pink." Though our bushes were ordered from the same grower, and came with identical labels, and have the same color flowers, those to the left of the central entrance persistently come into bloom at a different time from those to the right, though they all have the same southern exposure with no shade and there are no obvious soil differences.

Another St. Louis discovery has been how to manage and put to good use a spreading little Oriental stonecrop, *Sedum sarmentosum*. This is a small-leaved creeping succulent with tiny yellow flowers. Left to its own devices it can be a nuisance in almost any garden and it has completely smothered many a would-be rock garden. Yet in St. Louis its unique usefulness for one special problem has made it into a minor municipal asset and in the last thirty years it has become a standby for many homes within the city.

For most gardeners this creeping stonecrop is too given to spreading into places where it is not wanted. However as an edging for concrete walks leading up to the front door it is both attractive and practical. This is particularly true where the house is enough above the level of the street so that there are a series of steps. If the house has a southern exposure the concrete heats up so much that it is almost impossible to get grass of any kind to grow right next to the concrete. It begins to gully there in heavy rains and before one knows it the steps are being undermined.

As their name implies, these plants were evolved for such situations; they are native to exposed rocky places and can fight off the grass and other weeds better when they are right next to rocks. They are, to a lesser extent, being used around town between the sidewalk and the street, next to a porch or a terrace, or around small flower beds. More expert gardeners have learned to use them to cover front terraces which are too steep to be mowed effectively. It takes careful (and determined) management to encourage the stonecrop and to discourage the grass and weeds but it can be done.

These are just two examples of how a distinctive and appropriate kind of gardening has been evolving right under our noses during the first two hundred years of the City of St. Louis.

EDGAR ANDERSON

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's from 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 9:00 P. M. and on Saturdays, April through October, as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

December 1964
Volume LII
Number 10

COVER: With Henry Shaw's portrait looking down approvingly over her shoulder Mrs. Lee I. Niedringhaus, the President, meets with the other officers of the FRIENDS OF THE GARDEN. From left to right, Mrs. Joseph H. Bascom, Secretary; Mrs. Sydney M. Shoenberg, Jr., Treasurer; Mrs. Niedringhaus; Mrs. John H. Hayward, Second Vice President; Mrs. Edward L. Bakewell, Jr., First Vice President. Appropriately the group are meeting in what was once the reception room in Mr. Shaw's city residence, now the office of the FRIENDS OF THE GARDEN in the Administration Building at 2315 Tower Grove Avenue. Appropriately too, the furniture belonged to Mrs. Niedringhaus' mother, the late Mrs. Royall H. Switzler, a leader in establishing Garden Clubs in the Middle West. Thirty years ago her garden was one of the first demonstrations of how effectively oriental flowering crab apples could be used in the St. Louis area.

PHOTO COURTESY OF THE POST-DISPATCH

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor for this issue: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Mr. and Mrs. Chester G. Henry pause to discuss the history of the chrysanthemum shows with Dr. Anderson of the Garden staff. Mrs. Henry is Secretary to the National Council of State Garden Clubs.

hors d'œuvres, thus adding to the friendly and informal atmosphere of the occasion.

Of all the Garden's flower shows, the Chrysanthemum Show is the one which is markedly more effective at night than in the daytime. Particularly when the hanging baskets above come into full bloom, they catch the light and one is no longer conscious of the glass roof overhead. The various types of mums down below, cascade, spider-type, the giant globular headed ones which are traditional at football games, all show to full perfection by artificial light and one seems to be in a sort of magic garden.

(CANDID SNAPSHOTS BY HENRY HITCHCOCK)

MODERN DEVELOPMENTS OF AN ANCIENT ART AT TOWER GROVE HOUSE

During the first week in November Mrs. Mary Baer began installing her beautiful arrangements of dried flowers in Mr. Shaw's old country residence. This is the third successive year she has assembled carefully prepared materials and combined them imaginatively for the stately old rooms in which they are displayed. The increasing public demand for the June 1963 Bulletin in which she gave detailed directions for preparing such "Pleasant Ornaments" is one index of her ascending mastery of the various skills involved in producing these decorations. This Bullitin is on sale at Tower Grove House and at the Information Center at the Main Gate. This year, as last, Mrs. Baer has featured one of the Garden's little known shrubs, the saltbush (or silverling as it is known in parts of the South), *Baccharis halimifolia.*

E.A.

* * *

The Gift Shop in Tower Grove House has been temporarily closed until more adequate quarters for it are available.

WELCOME ELEANOR McCLURE . . .

With this issue of the Bulletin there begins a series of practical articles by Eleanor McClure, landscape and garden columnist, knowledgeable as to plant materials for this area and skilled in the practical management of our difficult soils. We hope you will like this innovation. Your comments as to what you would like to see in the Bulletin will be appreciated.

Henry Hitchcock, President, Board of Trustees

HOLIDAY DIVIDENDS

ELEANOR B. McCLURE

Fortunately for most of us, there are few garden chores that have to be done during the busy pre-holiday season. Yet, with all our distractions, there is one garden project that might profitably be scheduled for December: A quick survey of the planting, to check for over-all winter-time effect. This is really quite important. If our gardens are to appear in their cold-weather dress for a good part of the year—from November to April, usually—then it behooves us to see that the winter costume is as attractive as we can make it.

Incidentally, gardeners who are planning for winter effect can reap some extra dividends at this season. Many choice evergreens, judiciously pruned in December, can supply the "makings" for glamourous Christmas decorations and winter bouquets.

When planning for winter effect, it is important to select plants not only for their beauty but also for the functions they can perform in the planting. Where possible, it is best to choose the ones that normally attain the desired shape and size with a minimum of pruning. It is hard to make a landscape picture with "tortured" evergreens that have been trained into symmetrical spires, cones and globes. Sheared yews and junipers are rarely needed except in formal gardens or in a stylized treatment of a foundation planting.

Such giant conifers as spruces, firs, and pines need so much elbow room that they are best used for screen or background plantings in large gardens. As the trees mature, they will provide cones and boughs that can be harvested for indoor decorations.

Branches of the White Pine *(Pinus strobus)* aren't very effective when cut, for the needles tend to dry out very quickly. However, this evergreen makes a better landscape plant than either the Scotch or Austrian Pine *(P. sylvestris* and *P. nigra)*. The White Pine is a good choice for the smaller gardens, too, for it can be restrained by pruning off one-third or more of the new "candles" (developing branch tips) in late spring.

While the dwarf Mugho Pine grows too robustly for the foundation planting, it is a very effective evergreen for the background of a flower border. This pine isn't fussy about soil but grows best in an open, sunny spot. The branches have a natural, graceful curve, with a dense growth of needles, so that they make handsome plumes of green. They are so effective for indoor decorations that the Mugho merits planting for this purpose alone.

The American Holly, which long has been a symbol of the holiday season, deserves a space in nearly every garden. If there is ample room, it will make a stately specimen tree of broad, pyramidal form. Yet hollies take so well to clipping and shearing that they can be used for backgrounds and hedges in small gardens or can be espaliered against the wall in foundation plantings.

While the American Holly tolerates some shade, ample sunlight should produce fine foliage and a profuse crop of berries. Small plants should have protection for the first year or two. Once established, however, they are remarkably tolerant of winter cold, summer drought, and heat waves.

In past years most hollies were seedlings that showed great variations in their foliage, fruiting and hardiness. Some nurseries now offer named varieties that have been selected for their handsome leaves, size and profusion of berries, and general reliability. Among the ones I have liked are BETSY, CARDINAL, CHRISTMAS CAROL, CLARK, DELIA BRADLEY, FARAGE, HEDGE HOLLY, MANIG, MRS. SANTA, and YULE.

I am also partial to the hybrid, *Ilex opaca fosteri,* a plant that doesn't grow quite so vigorously and hence is particularly attractive in a foundation planting. The branch tips have small, crinkled dark green leaves and a profusion of berries, so that they make very effective indoor decorations.

Since the Foster Holly has one southern parent *(I. cassine)* this hybrid may suffer in a cold winter and needs a little pampering for the first two or three years. Established plants may have superficial injuries (mainly leafburn) but should come through without serious loss of branches.

One of the most beautiful plants for the garden and for decorations as well is the prickly Chinese Holly *(I. cornuta)*—and various smooth-leaved varieties such as *I. cornuta burfordii.* Although these plants flourish in southern Missouri and Illinois, they tend to resent the cold winters in the St. Louis area. However, I have some cutting-grown plants of *I. cornuta* that weren't a bit damaged by recent frigid winters. Isolated plants of *I. cornuta burfordii* have proved to be cold-tolerant, too, and perhaps we may someday have an improved strain. In the meantime I plan to go on testing such "hardy" varieties as *I. cornuta compacta* and *I. cornuta* WILLOWLEAF.

Heavy pruning of hollies is best deferred until spring, but some of the branch tips may be snipped off at the holiday season. Tip pruning is, indeed, quite beneficial, since it encourages heavy, dense growth.

The evergreen *Magnolia grandiflora* is a southern tree that grows well in this area once it has become established. Even a large tree may suffer leafburn and defoliation in a bitter winter. However, the magnolia is so handsome during the rest of the year that it deserves a place in many gardens.

The *Magnolia grandiflora* should be given lots of room, for it develops into a tall, buxom tree. Plants may be espaliered against the wall of a house, where it is more decorative than any vine. Since magnolias often need a little shaping, they can provide exotic branch tips that are ever so decorative for arrangements or Christmas decorations.

The versatile yew is commonly sheared to make formal hedges and accent plants, and is a special favorite for foundation plantings. These evergreens are also very attractive when pruned just enough to preserve their natural form. They should be used more often in other parts of the garden, too, for groupings of yews make a most effective low screen. Or they can be used as a background for rose beds and flower borders.

An established yew planting will have many long branchlets that can be snipped off at holiday season. The feathery green tips make decorative wreaths and table decorations.

Like the yews, boxwoods are usually sheared for formal effect. When allowed to grow more naturally, they are among the finest evergreens for background plantings. After the boxwoods have matured a bit, they will yield a surprising harvest of Christmas greens. The delicate branch tips make beautiful wreaths, and they are effective in all sorts of decorations.

Although many boxwoods may suffer some winterburn when grown in an open spot, a number of the seedlings introduced by Dr. Edgar Anderson are proving hardier and more tolerant. I saw one of these, named VARDAR VALLEY, flourishing in an open field in western Indiana. Chances are that this plant and other hardier boxwoods will be more widely available in a few years.

The evergreen pyracanthas have fine winter foliage, and they usually retain their orange berries in late winter. The hardiest ones we have tried are *Pyracantha coccinea*, *P. coccinea wyatti*, and a good upright variety, *P. kasan*.

The Heavenly Bamboo *(Nandia domestica)* should be rated as a half-hardy evergreen in this area, for in many winters the branches die back to the ground. When plants get off to a slow start in the spring, they may not flower and fruit that season. However, our plants have fruited well in many years, producing a cluster of bright red berries, which are borne like a plume on top of lacy green leaves. We have often picked entire branch tips, berries, leaves and all, to make beautiful and long-lasting arrangements.

Now one final thought: Even though evergreens are indispensable when winter effects are being planned, let's dispel the notion that our plantings should consist almost entirely of various kinds of conifers. Many suburban homesites that fairly bristle with pines, spruces and junipers have a heavy, funereal look. Moreover, they appear monotonously the same from season to season.

The graceful tracery of branches of deciduous shrubs and trees is an integral part of the winter landscape. Among trees with distinctive white or gray bark are birches, beeches, and the red maple *(Acer rubrum)*. The bark of the Tulip Magnolia *(Magnolia soulangeana)* turns silvery gray as the trees mature, and the big plump flower buds are quite decorative.

Brief mention should also be made of the many trees and shrubs that retain their fruits after the leaves have fallen. Hawthornes are often truly spectacular. A single tree, decked in bright red berries, can brighten the whole garden.

The deciduous hollies make a gay display in early winter, and they provide berried branches for holiday arrangements. The Black Alder *(I. verticillata)* is a medium-to-large shrub. The Possum Haw *(I. decidua)*, which flourishes in our native woodlands, may be grown as a small tree. After the birds have harvested the fruits, we may enjoy the silver-gray twigs and branches.

Fruits of many crab varieties persist until after the first of the year. Among shrubs that have bright red berries in early winter are the Red Chokeberry *(Aronia arbutifolia)*, the Spindle Tree *(Euonymus europaea aldenhamensis)*, the Linden Viburnum *(V. dilatatum)* the European Cranberry Bush *(V. opulus)*, and the American Cranberry Bush *(V. trilobum)*.

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CHOCHOS AND OTHER LUPINES IN ECUADOR

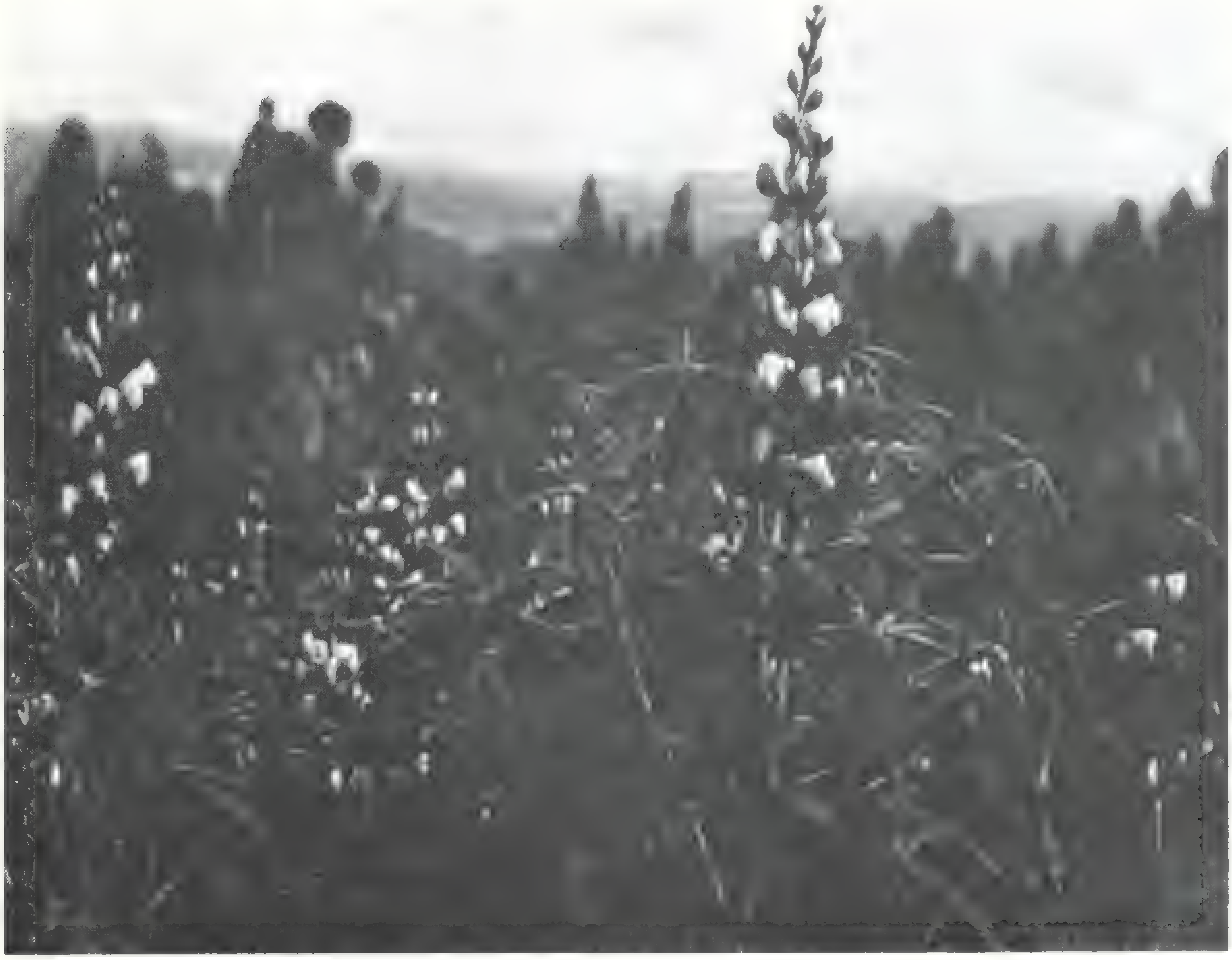
CHARLES B. HEISER, JR.

ONE of the first plants a person sees on arriving in Quito is *Lupinus pubescens*. This handsome species, which reputedly is the ancestor of many of our commonly cultivated ornamental lupines, occurs as a weed at the airport as well as in vacant lots and along roadsides in the vicinity of Quito.

Although this is perhaps the most common lupine in the country, it is by no means the only one nor the most striking. To gain some idea of how different some of the species can look, one has only to visit any of the *páramos*, cold, grassy stretches of the high Andes above timber line which are a virtual paradise for a botanist. Although grasses are the dominant vegetation in the *páramos*, many bizarre plant types are found there and lupines are well represented. From Quito which is situated at 9375 feet one can hike up to the peak of the extinct volcano Pichincha at over 15,000 feet, his lungs and legs willing. It was on these very slopes that General Sucre defeated the Spanish to gain Ecuador's independence in 1822.

For the first several thousand feet of the journey one passes through groves of *Eucalyptus*, a tree introduced early by the Spanish, and now practically the only tree of any size in the sierra. Soon all trees disappear and are replaced by various shrubs and bunch grasses. Here, on one of my trips, my companion, Saulo Soria, the younger brother of a former student of mine, and I paused to rest and to watch the humming birds, which are rather abundant in the Andes, pollinate two of the shrubs, *Barnadesia spinosa*, a red-flowered composite, and *Siphlocampylus giganteus*, a relative of the lobelia. The latter plant has a yellow flower admirably adapted to bird pollination. At 12,800 feet near Cruz Loma, *Lupinus pubescens* was still with us, and two other species, *L. rupestris* and *L. microphyllus*, appeared. "Small-leaved" is a good name for the latter species since it has leaves about one-tenth the size of some of the others. It grows prostrate and can be classed as a "belly-plant." One has to look closely in order not to miss it. Still a little higher *L. smithianus* comes in and *L. pubescens* at last drops out. Finally at 14,500 feet where patches of snow were still in evidence from a recent snow fall, two more species were found, *L. caespitosus*, a semi-prostrate form, and *L. alopecuroides*, the sight of which makes one temporarily forget the scarcity of oxygen at this altitude. For a description of this plant, I turn to my friend, Prof. Jorge Tinajero, although my translation can hardly preserve the eloquent enthusiasm of his original Spanish.

"No plant in all the world is the equal of *Lupinus alopecuroides*. Its inflorescence stretches out a yard and a half and is more than six inches in diameter, and is entirely covered with a whitish velvet, studded here and there with little flowers of an intense blue . . . it bears the name 'Tail-of-the-Fox,' when in reality it is a fur of



The *chocho (Lupinus mutabilis)* in flower.

the ermine, sprinkled with amethysts." Although I have never seen one quite this size nor do not entirely agree that it is without an equal, it nevertheless is most striking. One other lupine, *L. nubigenus*, although not so large as the 'Tail-of-the-Fox,' has an equally dense pubescence and grows at still higher elevations. Unfortunately, I never encountered it on any of my trips.

After lunch, we started back down the mountain taking a different route. The descent is easier on the lungs but is harder on the feet since one's toes constantly rub against the tips of his boots. The high *páramos* are uninhabited but before we reached 13,000 feet we found Indians pasturing cattle, and at 12,000 feet we came upon their scattered huts and fields. The principal crops here were barley, wheat, *quinoa (Chenopodium quinoa)*, *haba* (Broad or English bean), and a lupine, which is certainly one of the most attractive food plants that I have ever seen, which is the principal object of this account. The wheat, barley and *haba*, of course, were introduced by the Spanish, but the lupine, potatoes, *quinoa*, and a number of other plants were originally domesticated in the Andes, but with the exception of the potato have never become generally well known.

The cultivated lupine, *L. mutabilis*, called by the Spanish name of *chocho* in Ecuador, is an annual, two to three feet tall, with smooth leaves and stems, in contrast to the hairy ones of most of the wild species (which incidentally are called *ashpa chocho*, using a Quechuan word which, loosely translated, means "wild" or "of the field or woods"). The flowers of the *chocho* are nearly an inch in diameter, and are usually some shade of blue, touched with white and gold.* It is widely grown in the highlands from about 6,000 to nearly 12,000 feet and is said to do well in poor soil. Occasionally one sees a whole field devoted exclusively to *chochos* but more commonly they are mixed in fields of *quinoa* and dwarf maize. Sometimes they are planted around the edge of a field of maize, where according to some people they serve as a living fence, since they are unpalatable to cattle. In fact, several species of lupine in the western United States are known to be poisonous to livestock. However, although they are not eaten by cattle in Ecuador there is no assurance that the cattle will not go through them to get to the maize.

The pods when ripe are somewhat larger than those of most lima beans and contain two to five oval seeds which in Ecuador are nearly always white in color. The seeds contain alkaloids and can not be eaten directly. One wonders, just as he does with other plants so poisonous as to require special preparation before being used as food, how man ever learned how to prepare them for human use. In some way he found out that the seeds were edible after being washed in water which, of course, would leach out the alkaloids. The method in use in Ecuador today is to soak the seeds for several hours,* then after cooking to place them in running water for several days, usually in a stream or river. They are then sold in all of the principal markets and on street corners in Quito and other cities in the highlands. The Indians often buy a handful for a penny and munch on them the way we would peanuts. The taste is rather difficult to describe but it is more like that of a nut than that of a bean. The seeds are also added to various cooked dishes or are used cut up in the pepper sauce which is found on almost every table in the country.

The *chochos*, however, should be regarded as more than a condiment or a between-meals snack, for they are extremely rich in protein, richer in fact than most other legumes and thus they supply an important addition to the starchy diet of the Indian. Meat is a luxury to the Indians of Ecuador and thus the *chocho* remains an important plant in that country. Much of the land that once may have been devoted to its cultivation, however, is now given over to other legumes, broad beans and peas, introductions from Europe, which grow well in the highlands.† These plants were more acceptable to the Spanish conquerors and also their ease of preparation for table use

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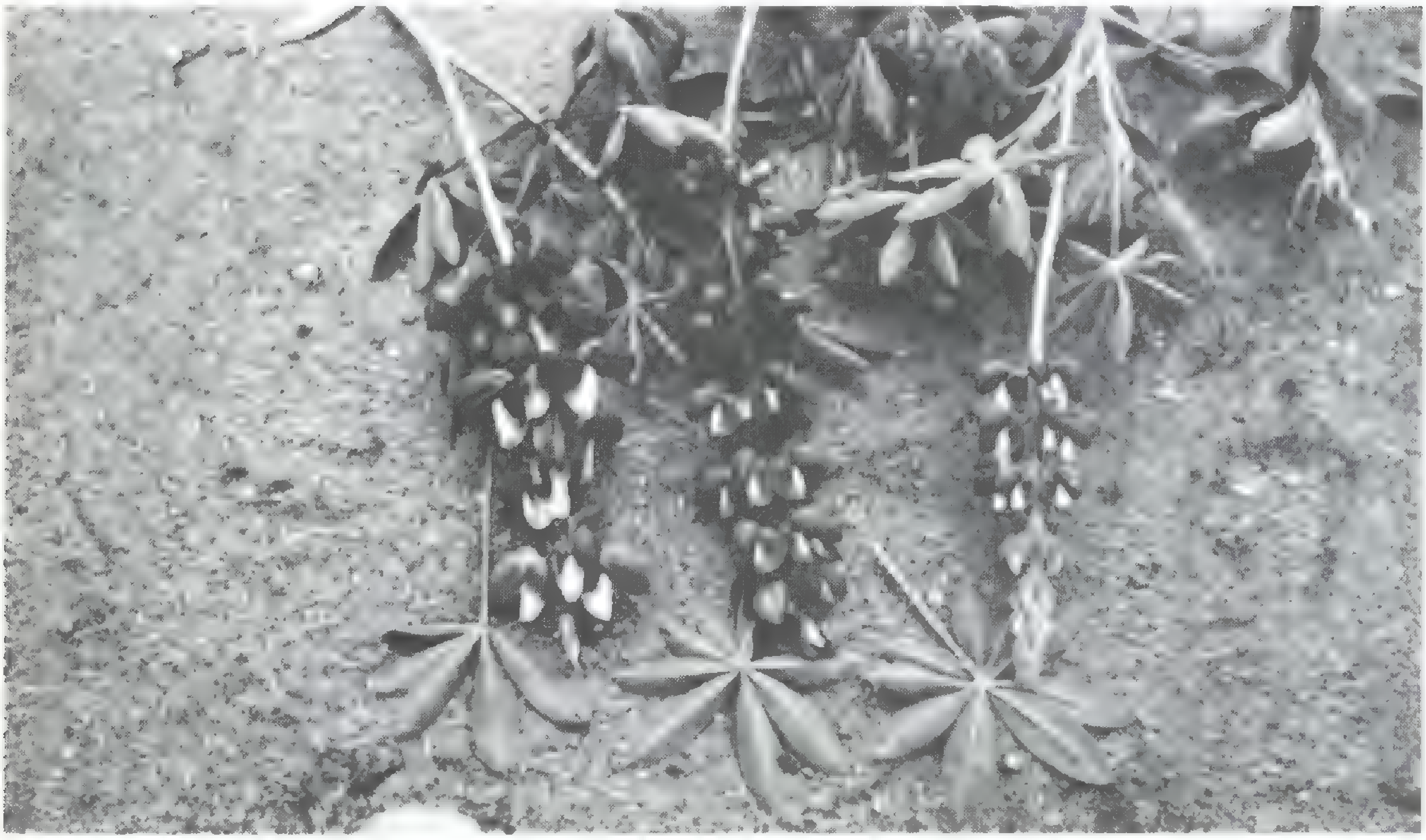
*This species is referred to as "*L. tricolor* Sodiro" by botanists in Ecuador, although so far as I can learn this name has never been validly published.

*In Peru the water in which the seeds are soaked is later used as an insecticide or fish poison. Margaret Towle. The Ethnobotany of pre-Columbian Peru. 1961.

†Carl O. Sauer. Cultivated plants of "South and Central America" in Handbook of South American Indians. vol. 6:487–543. 1950.



A hybrid lupine (center) and its parents, the *chocho*, *L. mutabilis* (left), and *L. pubescens* (right).

undoubtedly explains their increase in popularity.

Having been a student of Dr. Anderson, I naturally kept my eyes open for hybrids. It was some months before I found one, however. On a visit to the Indian Mission of Picalqué, located near Cayambe to the north of Quito, where my family and I were guests of a fellow Washington University alumnus, the Rev. Paul Streich, I found two plants which were clearly intermediate between *L. mutabilis* and *L. pubescens*. Thus in spite of its very distinctive appearance it seems clear that the *chocho* is not too distantly related to the wild lupines of the Andes, and I am inclined to look for its origin from wild species of this area.

Two Polish plant breeders,* however, have recently reached other conclusions. Their rather unusual hypothesis supposes that two North American species, *L. douglasii* and *L. ornatus*, in southern migrations of the Indians, were carried to the Andes where through hybridization with *L. pubescens* they somehow gave rise to the cultivated species, *L. mutabilis*. So far as I am aware the North American Indians did not use seeds of any lupines for food and before resorting to such an elaborate theory for the origin of the *chocho* other possible explanations need to be explored. For

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*T. Kazimierski and E. Nowacki. Indigenous species of lupins regarded as initial forms of the cultivated species: *Lupinus albus* L. and *Lupinus mutabilis* Sweet. Flora (Jena) 151: 202–209. 1961.

example, several wild species are found in South America which are not too dissimilar to the *chocho*, such as *L. illsworthianus*, *L. hornemanii*, *L. macbrideanus*, and *L. montanus* of Peru and *L. bolivianus* and *L. soratensis* of Bolivia. These species are known to me only through herbarium specimens, and some of them may be nothing more than "escapes" of *L. mutabilis* but some of them are certainly wild species. Clearly more careful investigations are called for before one reaches any conclusions regarding the origin of the *chocho*.

The introduction of the *chocho* into Ecuador almost certainly occurred in prehistoric times, although the wide use of the Spanish name rather than the Indian name might indicate otherwise. Certain other Andean cultivated plants, the naranjilla *(Solanum quitoense)*, and the *pepino (Solanum muricatum)* are known only by the Spanish name in central and northern Ecuador today. Perhaps the *chocho* was introduced into Ecuador shortly before the arrival of the Spanish. Ecuador was conquered by the Incas from Peru between 1463 and 1471. It is known that the Incas moved certain of the conquered people from one region of the empire to another in order to bring them "into line" more readily. Many people in Ecuador believe that the Salisaca and the Colta Indians represent such tribes who were moved by the Incas from Bolivia or Peru to their present territories near Ambato and Riobamba respectively. Today the Salisaca cultivate *chochos* extensively. Might this group not have been responsible for the introduction of the *chocho* into Ecuador? This is speculation, of course, and it may well be that the *chocho* is very ancient there.

In the highlands of Bolivia and Peru the *chocho* is still widely grown today. The tourist who visits the ancient Incan capital of Cuzco will find baskets of *chochos* a common sight in the markets. There the plant, however, generally goes by its Quechuan name, *tarhui* or *tarui*, and sometimes by another Spanish name, *altramuz*. White seeded forms are the most common but black seeded forms are also known. This is of interest since most related wild species have dark colored seeds and in many cultivated plants we find that light seeded forms have resulted through selection by man.

Thus far I have found little in the early literature which tells us much about the *chocho*. The padre, P. Bernabe Cobo, who in the seventeenth century gave us an excellent account of the cultivated plants of the New World, fails to say much about the *chocho* except that there is an abundance of wild *altramuzes* in the fields, which the Indians call *tar-ui*, and that they grow to such heights they serve for fuel. Garcilaso de la Vega, the son of an Incan princess and a Spanish noble, recorded that his mother's people had "lupins like those in Spain, only rather larger and more white, which they call *tarvi*."

The genus *Lupinus* not only has many species in both North and South America but it is also well represented in the Mediterranean region. There, also in prehistoric times, certain species were domesticated for fodder and human food. The genus therefore is one of the very few that has contributed plants for man's use in both the New and Old Worlds. Recently in Europe plant breeders have succeeded in developing varieties of these that are virtually free of alkaloids. One of the Old World species, *L. albus*, is marketed in this country under the name "lupini beans." These require considerable soaking before they can be eaten. "Lupine beans," in jars ready to eat, are available in the Italian markets of our larger cities. In appearance and taste these are rather similar to the *chocho*, so if someone would like to know what the *chochos* are like he should head for the nearest Italian market, unless, of course, he plans a trip to the Andes.

THE EUROPEAN HORNBEAM, *CARPINUS BETULUS*

ONE of the interesting old specimen trees in the Garden is the European hornbeam, northwest of the Mausoleum grounds with branches reaching out toward the azaleas. Early in life it was headed back close to the ground and developed three arching trunks. In the 1920's a tornado came within a few blocks of the Garden and the winds were high enough here to cause extensive damage. One whole trunk came down at that time but it was properly cut back as close to the main stem as possible and the tree has grown into a graceful whole.

The European hornbeam is closely related to the American hornbeam small trees of which are native to the Garden's Arboretum at Gray Summit. The European species grows into a larger and more graceful tree. Its pendulous flower clusters are larger and as they go to seed they ripen into strange green plumes whose curious details are more clearly evident than in the American species.

The attractive leaves are mostly two to three inches long nicely rounded at the base and coming to a point at the tip by a curve of almost mathematical regularity. They are attached to the twig by short slender leaf stalks, alternately to left and right. They tend to be limited to two sides of the twigs, but do not follow this generalization as a rule which cannot be broken.

The hornbeams bear their flowers in catkins, like willows, walnuts, poplars and a good many other trees in the temperate zone. The male and female flowers are borne on separate catkins. The male catkins are developed inside of buds and one does not see them until springtime. The female catkins, like those of birches, are exposed all winter. They are at the ends of small side-branches and are quite tiny until they begin to enlarge in early spring.

From March until late summer these fruiting catkins are fascinating objects. They can be beautiful when well developed particularly when they have not been stunted by long periods of dry weather. After the flowers have been fertilized the young seeds and the other features of the catkins increase rapidly in size and are quite conspicuous. The seeds look like little flat green urns. Cupped about them are the bracts, specialized, more or less leaf-like organs, each with one long narrow lobe and one or two short ones. The bracts form a kind of slashed green cornucopia an inch and a half long. These strange and handsome cornucopias make up the fruiting catkins which hang down from the almost horizontal twigs on which they are borne. Nearly all visitors to the Garden are interested in these catkins, once they have been pointed out. One reason they are not noticed is because they remain bright green until almost time for the seeds to fall and are inconspicuous, seen against the leaves. Another is that they are overhead and modern Americans do not ordinarily notice objects which you have to look up to in order to see. In June, for instance, our tulip trees are in flower with blossoms like green magnolias, decorated with liberal splashes of bright orange. Though one of these tulip trees has flowering branches right over one of the main walks, and one has only to glance up to see the brilliant flowers, thousands of our visitors come and go without seeing them.

Two years ago we had a large and attractive crop of these hornbeam catkins. Adequate rains the summer before had helped set plenty of female catkins and after they had fruited, the weather was pleasant and they remained in good condition for many weeks. Enough of them were gathered to make interesting flower arrangements, when combined with flowers, in an old epergne in TOWER GROVE, Henry Shaw's old country home. They lasted well and were a conversation piece and were much admired. They seemed particularly appropriate, for this old specimen probably goes back to Mr. Shaw's time. It must have been a delight to him in his later years when he knew he would never get back to England and see again the trees of his youth.

EDGAR ANDERSON

TRIFON VON SCHRENK, 1887–1964

TRIFON VON SCHRENK, Associate Curator of the Museum, died on October 21st after a brief heart attack. He was a world's authority on creosote and its standardization. For most of his life he was associated with his brother, the late Dr. Hermann von Schrenk of the Henry Shaw School of Botany, a pioneer in the study of tree diseases and a renowned expert on timber. Though for most of his career Trifon von Schrenk was only indirectly connected with the Garden, he took a kindly interest in all its concerns. For many of the students and the junior members of the staff he became a valued counselor helping them through personal and professional crises and widening their horizons in various ways. He was the son of German aristocrats who moved to the United States because of their devotion to democratic principles. Like them he combined pride in his distinguished lineage with constant consideration for his fellow man.

E.A.

FLOWERS AND AGRICULTURE

Ever since visiting Ethiopia I have been interested in learning more about the role of flowers in African cultures. In Latin America and in India I had found them to have been important since prehistoric times; in Ethiopia their role was a minor one. Recently I had a short visit from a Nigerian who grew up in a village in the Tropical Rain Forest just above the delta on the Niger. He is an intelligent man, a good observer, who knows English and uses it effectively.

According to this informant, flowers play a very minor role in native Nigerian culture as he knows it. When one meets with them they are usually due to missionary influence. "When traveling through the country if you began to see flowers cultivated here and there you always knew you were getting close to a mission and sure enough there would be a church along the road." A native child walking along with a bunch of wild flowers was asked why he was doing such an unusual thing. He indicated that he, too, thought it was a strange custom but he was carrying the bunch to his teacher at the mission, "because that's what she wants."

Many of the Nigerian tribes are expert plantsmen; it is one of the ancient centers of African agriculture. Various useful plants such as cassava (tapioca) are grown in dooryards as well as in native fields. If flowers are grown among them it is probably for another purpose. Lantanas, for example, are quite common around houses but they are planted primarily to help discourage snakes. The spines they develop under tropical growing conditions are apparently disliked by snakes. Bananas, on the contrary, are planted as fer away from the house as possible. Their heavy shade and litter attract snakes, including the poisonous ones.

As I have indicated elsewhere in a more technical paper, the relationships between cultivated plants and flowers need careful study by detailed methods. In the back country in many parts of the world, vegetables, root crops, drug plants, spices, fruits, and flowers for ornament are grown all together in a kind of garden-orchard. Scientists are just now finding their way into the problem. Advance is slow because the work needs to be done with both botanical and ethnological precision and the results need to be interpreted by someone competent in both fields.

What I learned from this visiting Nigerian is just one fragment; an indication of where to look for evidence, rather than evidence itself. However it is from a key area and it agrees with various other fragments in setting up the following hypothesis: There were early centers of agriculture in the Orient and in Latin America in which flowers played an important role. There was an early African center of agriculture where flowers were unimportant.

Edgar Anderson

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's from 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M. and on Saturdays, April through October, as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

January 1965
Volume LIII
Number 1

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THE Garden has one of each for sale, no longer in use here but still in good condition. For details call our Engineer, Mr. James Hampton, at TO 5-0440.

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LIII No. 1 Bulletin January 1965

POINSETTIA PREVIEW FOR FRIENDS OF THE GARDEN

THE preview of the Poinsettia Show was held from 5:30 to 7:30 on Friday, December 4th, and was well attended in spite of a cold wave and slightly hazardous driving. Starting in a small way the Poinsettia Shows have gradually been developed into a major display. The pink-flowered ones were massed by themselves on the upper terrace, the star-like ECKE'S WHITE was grouped under the balcony so that on entering one's impression of the show as a whole was of red and green. In designing the show Mr. Paul Kohl, the Floriculturist, had made clever use of an unusual new variety, FLAMING SPHERE, whose flower heads are a spiraling mass of red but whose basal leaves are more odd than attractive. By veiling these with old iron benches and using large specimen plants set close together, he created brilliant masses of red at either side of the display. Large white urns with graceful plants of English holly served as foils for the poinsettias.

The preview was arranged and carried out by the Executive Board of the Friends and the evening had a kind of holiday friendliness. Guests were greeted by members of the Executive Board and their Hospitality Committee and members of the Garden staff were on hand to answer questions. A group of young women selected by the Junior Committee assisted with the refreshments and helped everyone feel at home in the big greenhouse.

The Poinsettia Show will continue through January 10th. There will be preview parties limited to Friends of Shaw's Garden for the Orchid Show on February 5th and for the Easter Flower Show on April 2nd.

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CLEVELAND AVENUE GATE CLOSED WEEKENDS

In an effort to reduce vandalism the gate at Cleveland Avenue and Tower Grove Avenue will be closed at sunset and on Saturdays and Sundays, except during those hours when there are scheduled meetings in the Museum Building. New lamp-posts at the north edge of the entrance plaza to the Museum now illuminate all this area for those attending these meetings.

LAD CUTAK'S TWO BOOKS ABOUT CACTI

Those who have heard Ladislaus Cutak, our Greenhouse Superintendent, lecture know that he combines a detailed knowledge of wild and cultivated cacti with an inborn friendliness and a good sense of humor. His books are like his lectures and though they have been on the market for some time they are still in demand at our Information Center at the Main Gate. The liveliest of the two is designed for readers who have never looked carefully at a plant. It is a paperback of 110 pages: *Cactus Personified (Laughs with Facts)*, $2.00. Wildcrafter Publications, 1001 N. 13th Street, Terre Haute, Ind. Its illustrated keys have somewhat the aspect of a comic strip but they will work even in the hands of a beginner.

His much more comprehensive book is bound in cloth and includes advice on growing cacti in the home and greenhouse: *Cactus Guide.* $3.95. D. Van Nostrand, Princeton, 134 pp.

E.A.

A ST. LOUIS PREMIERE, THE 1965 PROJECT

Plans have moved rapidly forward for the St. Louis Première of *My Fair Lady* for the benefit of the Garden at the Ambassador Theatre on Thursday, January 21st. In one sense this will be a sort of homecoming for those interested in the Garden. The original site of Mr. Shaw's city residence was just across Locust Street from where the theatre now stands. After his death it was moved out to the Garden to form the nucleus of the Administration Building. From the side windows of the handsome old room shown in the accompanying plate one would have looked down at the corner where celebrities and ticket holders will enter over the traditional red carpet on the evening of January 21st.

The three Project Chairmen for the event are (in alphabetical order) Mrs. Joseph H. Bascom, Mrs. John H. Hayward, and Mrs. Sidney M. Shoenberg, Jr. Working under them are a number of very active committees. Those who contribute fifty dollars or more for a ticket are known as "Angels Unlimited." A special committee under the chairmanship of Mrs. John H. Hayward is promoting this feature: Mrs. Robert C. Corley, Mrs. Arthur H. Feuerbacher, Mrs. Harry S. Kramer, Jr., Mrs. Russell E. Lortz, Mrs. Austin P. Leland, Mrs. James Lee Johnson, Mrs. William Lee Polk, Mrs. Joel A. Rogers, Mrs. Thomas S. Hall, Mrs. Edward F. Schweich, Mrs. William J. Richert, Mrs. Donald Danforth, Mrs. Harry E. Papin, Jr., Mrs. Virgil Lipscomb and Mrs. William Blanke.

A similar committee for "Patrons" ($25.00 per ticket) is under the chairmanship of Mrs. Joseph H. Bascom: Mrs. M. M. Jenks, Mrs. Robert Meyer, Mrs. Henry Keeler, Jr., Mrs. Joseph Werner, Jr., Mrs. Neal Wood, Mrs. James Alfring, Mrs. Jerome Kircher, Mrs. John Christian, Mrs. Girard Brownlow, Jr., Mrs. William Cunliff, Mrs. Donald Emigh, Mrs. D. S. Plumb, and Mrs. Edwin S. Jones.

Other committees and their chairmen (or co-chairmen as the case may be) are: Advisory, Mrs. Lee I. Niedringhaus; Arrangements, Mrs. Samuel D. Soule; Decorations, Mrs. E. R. Culver, Jr., and Mrs. Ir A. Stevens; Corporations, Mrs. T. Randolph Potter; Ticket Sales, Mrs. Campbell Alexander, Mrs. H. C. Grigg, Mrs. Robert Hannon and Mrs. William E. Vesser; Finance, Mrs. Sidney Shoenberg, Jr.; Hospitality, Mrs. Albert Blanke, Jr.; Juniors, Mrs. Thomas Collins, Jr.; Publicity, Mrs. Edward Bakewell, Jr., and Mrs. Douglas D. Remmers.

Final Decisions. Left to right: Mrs. Edward L. Bakewell, Jr., First Vice President, and Mrs. Lee I. Niedringhaus, President of the Women's Executive Board of the Friends of the Garden, discuss the program for the première of *My Fair Lady* with Mr. Henry Hitchcock, President of the Board of Trustees, and Mr. Edward B. Arthur, President of Arthur Enterprises.

PHOTO BY ARTHUR FILLMORE

JANUARY TASKS

ELEANOR B. McCLURE

JANUARY is the season for fireside gardening: reading good books, thumbing through those fascinating catalogues, and making plans for the coming year. Just a little thought and foresight at this time can pay big dividends later on.

A fine way to start the new year is by starting a garden log or record book. It need not be large or elaborate, for even sketchy records can serve as a guide from season to season.

What to record in the garden log? First of all, a duplicate list of those seed and plant orders. Ample space should be left beside each item for data to be added as the season progresses: planting dates, time and length of bloom or harvest, and a record of over-all performance. Information about feeding and spraying can also prove helpful for future reference.

A second important step at this time is to evaluate the entire planting, viewing it with a really critical eye. Incidentally, it is much easier to do this now, while trees and shrubs are bare of foliage. Check to see whether each tree, shrub and evergreen contributes to the over-all effect—or that at least it performs some desirable function. Gardeners are often reluctant to discard "scrubbery" that has outlived its usefulness, yet often it is best for the garden to dig up and dispose of such plants.

Often it is wise to eliminate unsightly "weed trees"—usually elms and maples—that have poor form and branching. They may also be robbing nearby roses or other flowers of light, air, food, and moisture.

After taking inventory of garden assets and liabilities, it is a good idea to make a plan of the entire property, drawn to scale (four feet to one inch is a convenient ratio). Ruled graph paper will make it easier to map the area, but a large sheet of brown wrapping paper will serve the purpose. Be sure to include existing buildings, walks and drives, as well as the plantings.

After a careful study of this plan, sketch in possible changes or new plantings, including such desirable improvements as walks, terraces, walls, or garden features. Don't be afraid of radical proposals. Sometimes it's best to tear up old walks or poorly built terraces and get a fresh start in one or more specific parts of the garden.

The plan, of course, should aim at ultimate convenience and beauty, even though there may be a definite limit to the extent of improvements that can be made in a single year. Gardeners who work from a sound long-range plan can and often do have the satisfaction of achieving truly remarkable goals.

Once the long-range plan is decided on, it will be time to designate the plantings and other improvements feasible for the current year. As a rule, it is best to concentrate on one or two small areas at a time and do a thorough job with them. In this way, it will be possible to see gratifying results almost immediately. In unhappy contrast, those gardeners who stretch time and effort, doing a little bit here and a little bit there, are usually disappointed. And incidentally, the scattered plantings that result from this method are usually more difficult to maintain.

In considering his long-range plan, the gardener should give much thought to plant selection, where possible favoring those plants that will grow well in this mid-Mississippi Valley area. Horticulturally, we have a very difficult climate that subjects vegetation to extremes of heat and cold. Escalating temperatures in the winter months may lead to days of balmy weather, followed by a sudden sharp freeze, with another warm spell right on its heels. Droughts may occur in any season, accompanied by desiccating winds. High night temperatures in summer make it difficult to grow annuals, perennials, and roses. And during the hot weather, bluegrass goes on a sit-down strike, so that this region is often called the "heart of the crabgrass belt."

Such weather hazards have an important bearing on plans and decisions, and the wise gardener who is looking for trees and shrubs that are reliably hardy hereabouts will surely consult helpful nurserymen, as well as the Hardiness Zone Map of the U. S. Department of Agriculture.

One planning detail that should not be left to chance is deciding on the most favorable location for each plant. For example, various types of junipers are tolerant evergreens that resist drought and thrive in baking sun, but they do not grow well in the shade or on a northern exposure. Roses need a sunny spot, as well as freedom from competition with roots of nearby trees, and they appreciate good air circulation.

On the other hand, azaleas and rhododendrons that will thrive on a northern or eastern exposure may suffer winter injuries if planted to the south or west. Although *Magnolia grandiflora* is of marginal hardiness in this area, it may grow very well on the north side of a building, where it is protected from winter sun. A good rule of thumb in deciding on plant location: study the spot first, and then look for plants that will grow happily there.

Thus the vagaries of our climate inevitably affect garden planning and design. Since there may be extensive plant losses in periods of unfavorable weather, it is better to use groupings of plants than to depend on formally clipped hedges, where the loss of even one or two individual plants may spoil the whole effect.

When making a symmetrical doorway planting, be sure to select hardy evergreens that will tolerate clipping and shearing. It is a real chore to keep a pair of plants growing at a uniform rate. On the whole, it is better to plan for balance rather than absolute symmetry in the garden. An informal, naturalized planting is the most trouble-free of all.

While "gardening on paper" might be termed the task of the month, there is also an outdoor chore worthy of attention. It is wise at this season to check and see whether everything in the garden has adequate winter protection. If discarded Christmas trees are still available, the boughs might be placed on top of the mulch around roses, perennials, and small evergreens. Large branches (or even whole Christmas trees) can be thrust into the ground to make a screen for taller plants. The boughs, which admit plenty of light and air, tend to temper the wind and shade without smothering.

Evergreens in the foundation planting may need help during periods of heavy snowfall. An accumulation of loose, dry snow can be removed by gently lifting and shaking the branches. Care is needed, for they may be very brittle.

As a protection from avalanches of snow from the roof, tie small yews or junipers with a rope, spiraling it from the base to the tip. Remove it, of course, as soon as the danger is past.

Snow from walks and drives should never be shoveled onto nearby plants. Instead of using salt on paved areas, try a sprinkling of chemical fertilizer, or use sand, sawdust or wood ashes—materials that are not injurious to plants.

FLOWER SHOW SCHEDULE 1965

Through January 10	Poinsettia Show
January 17–31	Primrose Show
February 5	Orchid Show Preview
February 7–28	Orchid Show
March 7–21	Tulip Show
March 27–28	African Violet Show
April 2	Easter–Spring Flower Show Preview
April 4–25	Easter–Spring Flower Show
May 2–9	Lady Washington Geraniums
May 15–16	St. Louis Horticultural Society's Spring Flower Show
May 29–30	Rose Show
May 30–June 27	Hydrangea Show
July–August	Caladiums–Gloxinias
July 10	Day Lily Show (Hemerocallis)
August 7–8	Illinois Gladiolus Society Show
September 4–12	Henry Shaw Cactus Society Show
September 18–19	Harvest Show
September 25–26–27	Dahlia Show
October 16–17	Allied Florists Show
November 5	Chrysanthemum Show Preview
November 7–28	Chrysanthemum Show
December 3	Poinsettia Show Preview
December 5–January 9	Poinsettia Show

WHAT'S IN A NAME

Shaw's Garden is indeed the creation of Henry Shaw. He not only developed and endowed it but for the first thirty years of its existence (1859–1889) he selected and supervised its staff, he kept its accounts, he was in everything except the actual title, its first Director.

When he modestly chose the official name of "The Missouri Botanical Garden" he created a problem which becomes increasingly troublesome. This title leads people to assume that the Garden gets support from the State of Missouri. *It does not.* State or local taxes pay no part in our operations. We derive no funds even indirectly from the State of Missouri or the City of St. Louis.

The cost of operating the Garden and its Arboretum are budgeted to the income from Mr. Shaw's estate, the contributions of the Friends of the Garden, special funds raised by garden clubs, from Climatron admissions, an occasional bequest and from miscellaneous gifts.

Every increase in the cost of living makes it that much more difficult to operate the Garden. We cannot look forward to an increase in appropriations from the City or the State. *We have no such appropriations!* This is why the funds coming to us from the Friends of the Garden or those left us as bequests are so important. They are our only shield against inflation.

TREE LABELING BY THE MEN'S GARDEN CLUBS OF THE MIDWEST REGIONAL COUNCIL

One of the many ways in which the Garden has been helped by the Men's Garden Clubs of the St. Louis area during the last 12 years has been in their providing display labels for our trees and shrubs. Under the leadership of Mr. Arthur Krueger appropriate wooden and metal labels have been designed and installed. Keeping the labels in place in spite of weather, vandalism, and the growth of the tree itself is a never ending job. The following report by Mr. Arthur Krueger on the work done last November will give some idea of the time and attention the project requires, as well as indicating the atmosphere of good fellowship with which the work proceeded.

E. A.

On November 13th a telephone call from Dr. Cutler started things going on replacing missing labels, fixing broken wires, and such other tasks as were necessary to rectify the broken and missing labels. It was arranged for us to start on November 18th but we were snowed and rained out so when Mr. Rodes Clark, a member of the Richmond Heights Club, and I, arrived at the Garden we each put in two hours building ladders and getting out the wires and signs to be ready for our second visit.

The next nice day was November 24th. Charlie Walter, Secretary of the Men's Garden Club of Webster Groves, and I, arrived at the Garden, went over all the 40 trees along the Tree Trail, and others that were close by. In all we put on 25 new wires, straightened up about 16 signs, which consumed 6 hours. The next nice day was November 27th. Charles Burkett, Elbert Dean and I, members of the Men's Garden Club of Webster Groves, again came to the Garden and at this time we covered four-fifths of the trees in Shaw's Garden. Charles Burkett installed 38 new wires, Elbert Dean 40 new wires, Arthur Krueger 30. On December 9th, Dean, Burkett, a new man, Earl W. Hobbs of the Webster Groves club, and I placed 18 more hangers and straightened many labels finishing the job for 1964. So all told a total of 151 new wires were installed where necessary, along with 10 complete new signs.

Two of the men, the first time they ever appeared on this project, were very much delighted in doing it and were pleased to find out how interesting and educational it was. An interesting thing I learned was that one of our fastest growing trees is the sycamore tree. These trees grow completely over the wire that is attached to the signs. I observed that when one of the wires on the signs was broken, the wind would twirl the sign completely around and eventually the remaining wire broke and the sign fell to the ground.

In making our inspection of the trees, we came upon a number that were in bad condition and marked for removal. In these cases we removed the labels and located other good, living specimens and attached the labels to them.

We all enjoyed participating in this worthwhile project and lunch at the Garden and several coffee breaks added to our pleasure.

ARTHUR KRUEGER

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For more information, call TO 5-0440.

PITZMAN SUMMER NATURE STUDY COURSES

A free summer nature program for children between the ages of 7 and 16 is make possible by a grant from the Pitzman Foundation. Children have a fundamental curiosity about everything going on around them, and these summer courses encourage this interest in living things by bringing children into closer contact with nature and answering the many questions that arise from such an experience.

The program is held on 4 days a week, with Tuesday-Thursday and Wednesday-Friday sections, from 10 A. M. to 3 P. M. each day for two 5-week sessions. Children register for either the Tuesday-Thursday or Wednesday-Friday section.

Registration for the first session will begin June 1st and for the second session July 1st. For information about the courses and registration, visit the Main Gate Office or telephone TO 5-0440.

COURSES FOR ADULTS IN HOME GARDENING

Fees charged for the adult courses include all materials. Most classes and practice sessions will be held in the Garden's Experimental Greenhouse, reached by the Cleveland and Tower Grove Avenue gate.

Registration for all courses must be made in advance, since the number of persons who can be accepted for a given course is limited. Should interest warrant, second sessions will be considered and should less than fifteen persons register for any course, it may be dropped, in which case the fees will be refunded.

BUDDING AND GRAFTING

Instruction, demonstration, and practice of commonly used budding and grafting techniques helpful to the home gardener. The Garden will provide grafting knives, grafting tape, and some plant materials for the practice session. Students may bring their own plant materials if they desire.

1 Session — Fee $8.00 **Museum Building**
Tuesday evening — 7:30 to 10 P. M. **February 23, 1965**
Instructor: Mr. James I. McCaskill

HOW TO PROPAGATE FROM SEED

Fundamental facts and procedures for producing annuals, and perennials from seed for use in your garden. The Garden supplies seed, germinating medium and soil for four metal flats of seedlings which may be taken home. Persons wishing to supply their own seed may do so.

5 Sessions — Fee $12.00 **Experimental Greenhouse**
Tuesday afternoons — 1 to 2:30 P. M. **March 16, 23, April 6, 13, 20**
Thursday evenings — 8 to 9:30 P. M. **March 18, 25, April 8, 15, 22**
Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

HOME ORCHID CULTURE

Orchids suitable for home culture and best ways of growing them. Potting demonstrations and practice. Students may take home the plant they pot.

1 Session — Fee $10.00 **Orchid Greenhouse**
Saturday — 10 A. M. to 3 P. M. **April 3**
Instructor: Mr. Robert J. Gillespie

PREPARATION AND CARE OF LAWNS

Instruction on kinds of grasses and weeds and how to identify and control them. Preparation of ground for lawn establishment, soil conditioning, fertilizers and their application, rebuilding old lawns, maintenance and equipment will be discussed. Special attention will be given to individual problems.

3 Sessions — Fee $6.00 **Museum Building**
Tuesday evenings — 7 to 9 P. M. **August 10, 17, 24**
Instructor: Mr. Raymond Freeborg

PLANTS UNDER ARTIFICIAL LIGHT

Illustrated with practical equipment for the amateur or professional grower.

1 Session — Fee $5.00 **Orchid Greenhouse**
Saturday — 10 A. M. to 3 P. M. **October 9**
Instructor: Mr. Robert J. Gillespie

HOW TO PROPAGATE FROM CUTTINGS

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings. The Garden will supply a plastic covered metal propagating flat, medium and plant materials for 40 to 50 kinds of plants. Student practice will include propagation of house plants such as begonias and geraniums. Considerable attention will also be given to soft wood cuttings. The following methods of vegetative propagation will be discussed: root cuttings, suckers, divisions, hard and softwood stem cuttings, leaf, bud and scale cuttings.

5 Sessions — Fee $12.00 **Experimental Greenhouse**
Tuesday evenings — 8 to 9:30 P. M. **October 12, 19, 26, November 2, 9**
Thursday afternoons — 1 to 2:30 P. M. **October 14, 21, 28, November 4, 11**

Instructors: Mr. Clarence Barbre
Mr. Kenneth Peck

GUIDED TOURS

Organized groups and classes can obtain trained guides for visits to the Garden by telephoning TO 5-0440 at least ten days before their visit. Adults in tours, other than teachers with their classes, pay the usual admission to the Climatron but there is no charge for children or teachers with class groups.

SELF GUIDING TOURS

Climatron — An instructive pamphlet is available at the Climatron.
Tree Trail — An illustrated guide is available free at the Main Gate Office.

PROGRAM OF SATURDAY ACTIVITIES FOR 1965

JANUARY

2 "Dead or Alive." A field study of plants in winter.
9 "Winter Puzzles." Children will identify trees in winter by their twigs.
16 "Jungle Plants." A short trip through Climatron to learn about and view jungle plants.
23 "Table Top Greenhouses." Propagate plants from cuttings. (Bring a 1 lb. coffee container and plastic bag large enough to cover.)
30 "Life Secret of a Plant." Microscopes will be used to view plant cells.

FEBRUARY

6 "The North Woods." A slide-illustrated discussion on the forests in northern Michigan and Wisconsin.
13 "Mystery of the Orchid." Why is it different from all other flowers?
20 "Nature Movies." Three color sound nature movie films.
27 "Pin Cushion Forests." Life story of mosses. Take home labeled specimens.

MARCH

6 "The Story of Ferns." Comparison of ferns to mosses and flowering plants. Press fern leaves to take home.
13 "Plants in a Capsule." seed structure and how they are formed. Take home seeds.
20 "Miniature Gardens." Plant little gardens to take home. (Bring rigid container, maximum size 12″ × 12″ × 4″ deep.
27 "Sowing Seeds." Learn to sow seeds. (Bring 1 lb. coffee container.)

APRIL

3 "Rise of Forests." Plant succession or how forests come into being.
10 "Flower Shapes and Names." How to identify spring wild flowers.
17 "Nature Films." New color-sound movie films on a spring theme.
24 "Transplanting Seedlings." Transplant and take home plants for a small garden. (Bring a 1 lb. coffee container.)

MAY

1 "Woodlands of America." Study of major forests of Missouri and eastern United States.
8 "Plants with Wet Feet." Demonstration of aquatic plants. See them in underwater tunnel in Climatron.
15 "Prehistoric Plants." The story of fossil plants.
22 "From Dust to Seed." Flower pollination and development of fruits and seeds.
29 "Bees and Flowers." Observation of bees seeking nectar in flowers.

JUNE

5 "Tags for Trees." Make plaster casts of leaves to learn their structure.
12 "The Queen of Flowers." Sample and study the fruits of members of Rose family.
19 "Nature Hunt." A treasure hunt for leaves and seeds. Prizes awarded.
26 "Nature Films." A selection of the newest and best color-sound films.

JULY

3 "Little Round Green Things, and Others." The story of Algae in puddles and lakes.
10 "The Bread-Winning Family." Collect and mount grasses to take home.
17 "Dangerous Plants." Learn to identify poison ivy and other poisonous plants.
24 "Formulas for Flowers." Find new way to look at flowers and mount several to take home.
31 "New Generation." Collect seeds. Prize awarded to collectors of greatest number.

AUGUST

7 "Uses of Wild Plants." Learn way to use wild plants as source of water, food and dye.
14 "Table Top Greenhouses." Propagate plants from cuttings. (Bring 1 lb. coffee container and plastic bag large enough to cover.)
21 "Late Summer Landscapes." Draw or paint landscapes.
28 "How to Make a Terrarium." Small plants and soil for terrarium supplied by Garden. (Bring a wide mouth jar or small glass bowl.)

SEPTEMBER

4 "The Mighty Oaks." Make collections of important species to take home.
11 "The Hundred-in-One Flower." Study early fall flowers belonging to Sunflower family.
18 "Devil's Footstools." Mushroom demonstration including story of penicillin.
25 "Nature Movies." Three color-sound movie films.

OCTOBER

2 "Planting Bulbs." Paperwhite narcissus bulbs planted to take home. (Bring a 1 lb. coffee container.)
9 "Fall Treasure Hunt." Field trip in Garden. Contest and prizes for solving riddles and trail finding.
16 "Fall Colors." Draw or paint scenes in Fall color.
23 "The Forests of the Rocky Mountains." A travelogue illustrated with slides.
30 "Nature Movies." Three color-sound movie films.

NOVEMBER

6 "Bird Feeders." Make a simple bird feeder to take home. (Bring an empty half-gallon milk carton.)
13 "Soil and Water Conservation." A study of soils and erosion, watersheds and forests, the dangers of water pollution.
20 "Fun with Fruit." Learn to identify variety of fruits. Prizes awarded.
27 "Deserts." The deserts of North America and how plants live in them.

DECEMBER

4 "Insectivorous Plants." Demonstration and description of weird plants that digest insects.
11 "Christmas Decorations." Make decorations from seeds, seed pods, cones, etc., to take home.
18 "Christmas Wreaths." Make a Christmas wreath to take home. (Bring a wire coat-hanger.)
25 Holiday. (No program will be held.)

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

MISSOURI BOTANICAL GARDEN

Bulletin

February 1965
Volume LIII
Number 2

COVER: The big Pin Oak aluded to by G. H. Pring in his article for the Bicentennial issue of the BULLETIN last May. Though just outside the present Garden it is one of the original trees from Henry Shaw's arboretum and survived two tornadoes as well as several decades of heavy coal smoke. It stands in front of an apartment house which is just slantwise across Alfred Avenue from the Garden's service gate. Though somewhat stunted by the years of smoke it endured in middle life it shows how large Pin Oaks can get when they become really mature. Some of the problems facing St. Louis as our avenues of these beautiful trees get larger and older are touched on in Dr. Anderson's article in this issue.

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Outstanding Botanical Gardens

New Friends of the Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879

Missouri Botanical Garden Bulletin

Vol. LIII No. 2 February 1965

ON THE BAD HABITS OF CERTAIN SHADE TREES

EDGAR ANDERSON

Nearly all shade trees can be bothersome in one way or another but much of the literature about them concentrates on their good points; it is only when you have lived closely with them for a number of years that you learn the adjustments which must be made if any particular kind is to become a close member of the family. If you know something about them before they are planted you can locate them to give the most enjoyment and the least inconvenience.

It was a New England farm wife who made me realize how really disagreeable as close neighbors some beautiful trees can be. She was living in an old square colonial farmhouse, beautifully proportioned, well preserved. Between the house and the road was a row of European lindens, small-leaved, fine twigged. With their dense symmetrical tops they were handsome summer and winter, outlined against the white house. When I came to know the family I spoke admiringly about them to the old lady. She dropped her usual reserve and said with some bitterness, "Well, if you had to live as close to them as we do, you'd change your tune. It isn't only that they make a lot of litter; more of it than you'd believe is so fine it comes through the window screens. First it's the buds, then it's the flowers, and then it's that fuzz on the seeds. If it isn't one thing it's another. We have to keep the windows tight closed on the front side of the house a good deal of the summer, when we'd like to open them for the cross draft." Twenty years later after we moved into the Cleveland Avenue Gate House at the Garden I thought again and again of the old lady's remarks.

Our garage was sheltered by a basswood (American linden). While it was not close enough for the finer litter to blow in through our screens, it was so near by that we had it under day-by-day observation. The old lady was right. The various objects a linden sheds are more of a continuous performance than one would have believed possible! First are the bud scales. They are large for the size of the bud and they do not all fall at once. As the leaves open and the twigs develop there is continuing litter. In early summer the flowers begin to open. They are beautiful in a quiet way and early in the morning they smell like honey but they drop petals and dried-up stamens and day after day a heavy dust of pollen. The flowers are in small clusters; only a part of a cluster sets seed, the others dry and drop off. When really hot weather sets in, many of the remaining seed balls begin to blast and shrivel, eventually to fall. There is a pretty continuous harvest of gritty little felt-covered nutlets. Then in autumn the ripe ones come down but not all at once. Each hangs by a slender stalk from a stiff green parchment bract several inches long which whirls like helicopter blades as it falls. With the help of winds they may be carried for hundreds of feet.

All of this sequence is interesting to observe. It becomes part of the recurring tide of the seasons and one takes pleasure in it but a more undiluted pleasure if there is a good stretch of lawn in between the tree and the observer's home. Basswoods and other lindens make fine lawn trees but they should be fifty feet away from the house and not immediately adjacent to a walk or a driveway.

Other trees whose litter may be a problem include the following:

Magnolia grandiflora. The handsome large leathery leaves are shed a few at a time for month after month. One tree beside a small patio can be serviced efficiently but a number of them on different parts of your grounds will demand many hours of tidying in the course of a year.

Elms. The winged seeds, borne by the bushel on mature trees, are a special problem in gutters and downspouts. The wind carries them high in the air and some of the places they lodge are difficult to reach. Fortunately they bloom only in the early spring and the seed harvest is soon over.

Sycamore, *Platanus occidentalis.* As soon as a tree gets of any size it sheds its bark in strips and patches. Over and above the actual labor of disposal, many householders develop a strong emotional reaction against such innate untidyness; they get to hate sycamores. In mature specimens the fuzzy seed balls are sometimes borne in large enough numbers to present a problem.

Sweet Gum, *Liquidambar styraciflua.* The woody seed-balls are so innately handsome that they are still sometimes gilded and used for Christmas tree ornaments, as they were by early settlers. A few handfuls of them, gathered when they are still perfect in form and displayed in a wooden bowl on a library table, will be of interest and quiet beauty for several weeks. The small brown seeds which are shed from these balls, mostly before they fall, are important in the winter diet of many birds. Quail will scratch for them beneath the trees for months in autumn and early winter. Even in the city, pine siskins and other seed-eating birds will be attracted to the tree tops. Yet the seed balls are nearly the size of a golf ball and so woody that they may take over a year to decay. They are spiky enough to be unpleasant to walk on. Accumulating along a shaded pathway or in the paved areaway of a garage they are disagreeably inconvenient.

Pagoda-tree, *Sophora japonica.* The yellowing flower petals and shiny green seed pods are little or no problem where they fall upon the grass but if a walk or driveway passes beneath the tree it may require almost daily care over a long period. The white flowers are shed almost continuously for over a month in the summer, over two months in some years, and the shiny green seed pods come down a few at a time in August and September. They get slimy and unsightly as they age and will stain a light-colored walk when tread upon.

INVADING SEEDLINGS

Some trees are a nuisance because they seed down heavily into flower beds, shrubbery groups and rose gardens. The worst are those which establish themselves so rapidly that by the time they are discovered they are too big to pull up, yet sprout back repeatedly when they are cut off.

The handsome seedlings of the Goldenrain-Tree *(Kolreuteria paniculata)* sprout so abundantly and grow so rapidly that they might become a nuisance if they were widely scattered. They are a problem only when plots of shrubbery or areas clothed with a ground cover are immediately adjacent to the mother tree. Then the young seedlings have to be repeatedly searched for while they are still small enough to pull up easily. In the same way a female tree of white ash can be a real nuisance if it abuts directly on a large rose garden. Ash seedlings have a way of coming up in the center of the shrubbier rosebushes. Their removal can be difficult and painful.

THICKET FORMATION

A few trees have the capacity to develop into thickets. Sometimes this is by special stems which spread under ground and throw up new shoots. Much more rarely the roots themselves when conditions are just right can organize a young stem out of their own tissue and it grows upward to the light. Under the proper conditions these thickets may be attractive and easy to maintain. The Museum Building is effectively screened from the dust and noise of Tower Grove Avenue by a miniature grove of the rare native corkwood *(Leitneria floridana)*. However, corkwoods would be a nuisance in most gardens and a problem in many parks. A handsome thicket of pawpaws *(Asimina triloba)* forms an exotic screen for the service drive along one side of the grass plot south of Mr. Shaw's old country home. It is readily kept within bounds and withstands the wear and tear of being adjacent to one of the main study areas of the Children's Summer Program.

White Poplar *(Populus alba)*. These European trees are attractive as young saplings because of the velvety white felting on the under sides of the leaves. As the tree ages it is increasingly prone to form scattered thickets of root sprouts over a wide area. These are usually unsightly and difficult to control. This is now widely enough known so that the white poplar is no longer as frequently planted as it used to be.

Tree-of-Heaven *(Ailanthus altissima)*. Its rapid growth and ability to root sprout make difficult the eradication of seedlings only a few months old. Removing an old tree frequently results in extensive thickets which are expensive and difficult to eliminate even with patience and the skilled use of herbicides. Yet it can withstand neglect and abuse and polluted air and still be a thing of beauty. To hundreds of thousands in city slums it offers the only available shade.

UNSIGHTLY IN OLD AGE

Many kinds of trees become increasingly handsome as they age though most of them become more difficult (and more expensive) to maintain. A few kinds of trees get uglier as they get older. The Siberian elm ("Chinese elm," *Ulmus pumila*) though handsome when it leaves the nursery becomes increasingly unsightly and broken down as it ages. Since for many new homes "Chinese elms" are the only available shade, plans should be made to replace them as soon as possible with something more suitable.

Hemlock *(Tsuga canadensis)*. North and east from St. Louis our common hemlock can age into a picturesquely beautiful tree. St. Louis is too far south and west for the hemlock to be satisfactory as a mature tree. The little hemlock you bring home from the nursery, with reasonable care, will be lovely summer and winter, for ten to twenty years. When it gets to bearing its tiny cones and is beginning to look really treelike, it comes under increasing tension with the climate. How long it can be kept attractive will depend upon the care it is given and the site. It wants partial shade, protection from drying winds, a north slope if possible and faithful watering during periods of drought. It is also intolerant of air polution. When it begins to look ratty it is wise to replace it.

Lombardy poplar *(Populus nigra* var. *italica)*. In parts of Europe the Lombardy poplar lives to a great age, increasing in dignity and beauty. In much of the Middle-West it is short-lived. About the time it gets high enough to shade second-story windows it either dies outright or has dead branches, particularly in the upper part of the tree where branches are difficult to remove though unpleasantly conspicuous. Heading the tree back repeatedly while it is young may delay the process but is no real cure.

TREES WHICH GROW TOO WELL

Pin oak *(Quercus palustris)*. The accompanying illustration shows the pin oak described by Mr. Pring in the June 1964 BULLETIN. It is next to an apartment house on Alfred Avenue and is one of the few trees which have survived from Henry Shaw's original Arboretum. It is a magnificent veteran. It has survived two tornadoes in which the Garden's trees were damaged and came through many years when the smoke was heavy enough in this part of St. Louis to cripple oaks. Yet it points a problem which a few gardeners in the St. Louis area are beginning to think about. Pin oaks do well here. They grow rapidly and make fine looking avenues of trees for at least forty years. But they keep on growing. The oldest plantings in the city (such as the avenue of them between the Quadrangle and the Chapel at Washington University) are already reaching the size where they become inconvenient neighbors. They were planted in the early nineteen hundreds. By the 1940's they were a dignified avenue and very much admired, particularly when the leaves turned color in the fall. Since about 1950 they have been slowly growing a little more unsightly year by year in spite of increasing care. Pin oaks are native to flood plains; on a hilltop campus the bigger they get the more difficult it is to supply all the water they need. Dead branches become increasingly evident. Yet the trees are already so large that keeping the dead wood out of the tops becomes difficult and expensive. They are already inconveniently large and they keep on getting larger and larger.

The problem of aging pin oaks is difficult because it is a new problem; there is no one to turn to for advice. It was not until the nineties that this oak began to be advocated for avenue planting. In the next few decades we shall probably learn just how much of a problem mature pin oaks can be and the best way of dealing with them when they become embarrassingly large in overcrowded areas.

Trees Which Plug Drains

Poplars and willows head this list. The Carolina poplar *(Populus canadensis)*, a lusty hybrid, is one of the very worst offenders. Its roots will find their way into a drain with fabulous efficiency and produce a mass of branched rootlets which plug it completely. This in one of the reasons it is not so commonly planted as it was about sixty years ago.

Trees With Disagreeable Odors

The male Ailanthus tree gives off an unpleasant and penetrating odor when in blossom. The plum-like fruits of the ginkgo give off an unpleasant odor, particularly when they have been stepped on. It is getting increasingly possible to buy ginkgoes raised from cuttings taken from male trees. Unfortunately ginkgoes grow so slowly and are so long-lived that those who suffer inconvenience from the fruits seldom or never have even heard of the person who planted that tree. The trees of a community involve not only cooperation between people but cooperation between successive generations. To succeed, there must be wisdom and public-spiritedness and good luck.

BICENTENNIAL GARDEN SYMPOSIUM

Sponsored by the Garden Club of St. Louis for the benefit of the Missouri Botanical Garden and the City Art Museum.

Wednesday, Thursday, Friday, March 10, 11, 12

Admission $20.00 (by invitation only) includes all lectures (at the Art Museum), two luncheons, a reception for Symposium participants, and Bus Transportation between the Museum and the Botanical Garden.

Nationally Known Speakers

Invitations may be secured by writing: Bicentennial Symposium, P. O. Box 4043, Jennings Branch, St. Louis, Missouri 63136. Registration limited.

FEBRUARY TASKS

ELEANOR B. McCLURE

THE one certain thing about our mid-Mississippi Valley weather is that it is always unpredictable. If February brings a spell of nice, balmy weather, the chances are that there will be snowdrifts in March.

While the spring-in-winter weather often tempts many gardeners, it is a mistake to rush the season. Winter coverings should not be removed until the weather is fairly settled, and spring plantings are best deferred until the soil is warm and mellow. Since this date depends on the weather, it may come at any time between early March and mid-April.

Warmish February days do offer a fine opportunity for pre-season chores and tidying up. Since the most drastic pruning and shaping of deciduous plants should be scheduled for their dormant season, February is an excellent time to tackle tired "scrubbery" or neglected climbing roses.

The correct renewal pruning of an old shrub does more than add æsthetic value, for it produces a more vigorous plant. Substantial quantities of the plant's food are taken from its leaves and branches in autumn and stored in its roots over the winter. When we cut off about a third of the branches of a shrub, the remaining two thirds can enjoy the food supply that had been stored away for the use of the entire plant. These extra rations encourage more rapid and sturdy growth. In contrast, when leaves and branches are cut off later in the season, some of the plant's food is removed as well. Summer pruning therefore tends to inhibit growth.

Winter pruning is preferable for another reason. Without the covering of leaves, it is easier to see the architecture of the plant and to untangle overgrown branches. First, remove all dead branches (which will look brown beneath the bark). Then cut off about a third of the remaining stalks at ground level, selecting the oldest and largest ones—particularly if they show signs of borer or having rather poor branching.

If possible, avoid cutting off branch tips (and flower buds) of shrubs that are scheduled to bloom this spring—for example, various kinds of philadelphus, viburnums, and lilacs. Such tip pruning is best deferred until after their flowering season is over. If the branches are shortened at this time, the plants will produce an abundance of new growth that will bear flowers in the following spring.

On the other hand, summer flowering shrubs that bloom on new wood produced during the current season should be cut back severely in late winter. Rather drastic pruning of tired old stalks of caryopteris, crape myrtle, and *Abelia grandiflora* will result in better branching and shapelier shrubs. Branches of roses of Sharon, hardy hydrangeas and hypericum can be shortened by about a third. Such judicious pruning will produce sturdy new wood and hence increased bloom during the summer season.

The pruning of most evergreens is best deferred for a while. At this time it is usually difficult to tell the extent of winter injuries to broad-leaved evergreens, such as various kinds of hollies. By waiting until the new buds begin to break, we can tell just where the cut should be made. Yews and junipers may also be shaped when the buds start new growth.

Late winter is an excellent time, however, to prune trees. Young shade trees may need shaping, a task best started while they are in the formative stage. Some lower branches may be removed to provide more head room or clearance for nearby walks and drives. It may be possible to correct a weak crotch, where two branches meet to form a sharp, narrow V. If the weaker branch is cut off close to the trunk, the bark will soon cover this small wound. Although the tree may look a bit sad at first, given a chance it will develop the desired symmetrical shape.

It is wise also to make a health check of larger shade trees. Dead or storm-damaged branches should be removed, along with others that hang too low over a drive or building. Weak crotches should be cabled or braced.

Excellent information on these and other problems of pruning can be found in many good books and also in the special pruning manual published as the February 1960 MISSOURI BOTANICAL GARDEN BULLETIN. However, the pruning, cabling or bracing of a large tree is not a do-it-yourself project. It should be entrusted only to a competent arborist. Home owners should beware of itinerant "experts" who butcher so many fine shade trees, for their work is not pruning but an act of mayhem.

Another task that may often be completed in late February or early March is the early season care of the lawn. It is important, however, to wait until the ground firms up enough to make a good walking surface. If the soil is too soggy, it will be compressed with every footstep. On the other extreme, when the ground is frozen the chemicals are not absorbed and may instead be leached away. Nitrogen in particular is subject to great loss, as this element is just about as soluble as sugar or salt.

As a first step, rake off excess dead twigs and leaves, so that the chemicals will have a better chance to penetrate the soil. The airy mix raked from the lawn may be spread as mulch beneath evergreens and shrubs, or it may be added to the compost pile.

Lawn areas should then be fed at the rate of four pounds per 100 square feet, with a mix of one part of ammonium sulphate (for a quick pick-up) and three parts of slow-acting milorganite. We have had even better results from an expensive but long-lasting urea-type fertilizer, which continues to feed the plants even through the hot summer months.

A crab grass control may also be applied at this time. Some preparations, in fact, contain both a control and a fertilizer. However, this spring we plan to try a new product which is applied in liquid form. Developed in

St. Louis, it promises to be more economical and to inhibit germination of crab grass seeds along with those of many other weeds. It is said, for example, to prevent the growth of the pesky annual bluegrass, *Poa annua.*

Although some claims are made that crab grass controls will not inhibit the sprouting of bluegrass seeds, we are not convinced that this is true. If worn spots must be reseeded at this time, it is probably best to omit controls from those areas.

One final early season task is the grooming and tidying up of ground cover beds. Plantings of euonymus and ivy can be "combed" with a leaf rake, to remove excess leaves, twigs and debris. The vines should then be clipped short to produce low, dense branching. Chemical fertilizer may be added at the rate of four pounds per 100 square feet. A mulch of partly rotted sawdust or leaf compost will have a tidy look and will also be appreciated by the plants.

When euonymus buds begin to swell (about a week or so before they leaf out), it is time to spray with the winter oil which controls the destructive euonymus scale. Pachysandra and shrub roses should be sprayed at the same time. The oil spray is best applied on a sunny day, when the temperature is between 45 and 60 degrees. Two or three melathion sprays may also be needed in late spring, when the scale insects are in the crawler stage.

EVENING VISITS TO THE CLIMATRON

A VISIT to the Climatron at night carries you off into another world. As one approaches the building the illumination caught by the thousands of triangular panes, makes it loom up overhead and calls attention to its dramatic appeal as a building. Once inside, the effect at night is precisely the opposite; the building is forgotten. One is conscious more than in the daytime of the layer upon layer of tropical vegetation overhead. The variation in leaf size and shape and texture is accented. For those of us who grew up in the temperate zone the overall design is so fanciful as to give a sense of magic. Those who have lived nearer the equator sometimes feel as if the paths from an old tropical garden had been extended into an adjacent jungle.

Unfortunately it costs money to keep the Climatron open at night and regretfully the Garden has had to limit the evening hours to 7:00 P. M. on Sundays and on the four holidays, Memorial Day, Fourth of July, Labor Day and Thanksgiving Day. Otherwise on Mondays through Saturdays it closes promptly at 5:00 P. M.

However, *groups who wish to take an evening tour* of the Climatron may still do so by making special arrangements. The *minimum charge* for an evening Climatron tour is $25.00. The basic admission fee to the Climatron is 50¢ per adult. Reduced rates for adult groups are: 35¢ each for groups of 20 to 100; 30¢ each for groups over 100. For reservations, or further information, call the Tour Division at TOwnsend 5-0440.

A FEW OF THE WORLD'S OUTSTANDING BOTANICAL GARDENS

EVERY so often someone who is planning a trip asks us about botanical gardens in *that* part of the world. With the thought that this kind of information might interest a wider audience we have prepared the following skeleton list. This is not an easy matter. There are in the world well over five hundred botanical gardens even if you draw up a list of minimum standards before you admit any institution to that category. At the one extreme are world famous collections such as those at the Royal Botanic Gardens at Kew or the one maintained by the State of Bavaria in Munich, Germany. At the other will be some little old garden hidden away behind a gate in the wall, as for instance the picturesque one at Padua in Italy. It is open to the public only from spring to fall, is closed weekends, and has no greenhouses but it has some fabulous old trees and has been continuously in operation since 1545.

Another difficulty is the need of recent information if the list is to be useful. Botanical Gardens demand constant and expert maintenance. They are much more sensitive to changes in government than public art museums or even royal palaces. Brief notes call attention to outstanding features.

UNITED STATES

(Arranged roughly from the East Coast to the West Coast.)

ARNOLD ARBORETUM. Boston, Massachusetts. Original Arboretum at Jamaica Plain, also 115 acres in Weston. Oriental trees and shrubs, lilac collections, conifers, flowering crab apples.

NEW YORK BOTANICAL GARDEN. Bronx Park, New York.

BROOKLYN BOTANIC GARDEN AND ARBORETUM. Brooklyn, New York. Japanese garden. Bonsai trees.

MORRIS ARBORETUM. Philadelphia, Pennsylvania. Oriental trees. Medicinal garden. (Within the Philadelphia area are a number of small Arboreta and Botanical Gardens. Information about their hours, location, and special features can probably be obtained from the Morris Arboretum or the Philadelphia Academy of Natural Sciences.)

LONGWOOD GARDENS. Kennett Square, Pennsylvania. Water Gardens. Display greenhouses of tropical and subtropical ornamentals (orchids and acacias).

U. S. NATIONAL ARBORETUM. Washington, D. C. Azaleas, camellias and rhododendrons.

IDA CASON CALLAWAY GARDENS. Pine Mountain, Georgia. Azaleas, roses, hollies.

FAIRCHILD TROPICAL GARDEN. Miami, Florida. Palms, ornamentals, cycads.

KINGWOOD CENTER. Mansfield, Ohio.

THE MORTON ARBORETUM. Lisle, Illinois. Native spring wild flowers, hedges, ground covers, flowering crab apples.

DENVER BOTANIC GARDENS. Denver, Colorado. New but developing rapidly.

Sonora Desert Museum. (16 miles west of Tucson, Arizona.) Desert plants and animals. Superb desert exhibition trails.

Desert Botanical Garden. Papago Park, Phoenix, Arizona. (Tempe). Cacti and succulents, native shrubs.

Boyce Thompson Southwestern Arboretum. Superior, Arizona. Picket Post Mountain, a landmark on the grounds, with plantings of desert plants from all over the world at its base.

University of Washington Arboretum. Seattle, Washington, Rhododendrons.

University of California Botanical Garden. Berkeley, California. Succulents, rhododendrons.

Strybing Arboretum and Botanical Garden. Golden Gate Park, San Francisco, California. Southern hemisphere trees and shrubs.

Los Angeles State and County Arboretum. Arcadia, California. Subtropical ornamentals.

Rancho Santa Ana Botanic Garden. Claremont, California. California native plants. Mass plantings of shrubs, perennials and annuals. Best March through May.

CANADA

Montreal Botanical Garden. Montreal, Quebec. Fine greenhouse displays. A vegetable garden which is an education to visit.

Dominion Arboretum and Botanic Garden. Ottawa, Ontario. Lilacs, hybrid lilies, flowering crab apples.

CENTRAL AND SOUTH AMERICA AND THE WEST INDIES

University of Mexico. Mexico City suburbs. Trails with native plants through the Pedregal (lava flow area) adjacent to the Campus.

Hope Gardens (Royal Botanic Gardens). Kingston, Jamaica. Cacti, shrubs, and flowering trees.

Castleton Gardens. 19 miles north of Kingston, Jamaica, at St. Mary. Situated in a more humid climate than Hope Gardens and featuring lush rain forest plants.

Jardim Botanico. Rio de Janeiro, Brazil. Fine palm avenues, flowering trees.

Jardim Botanico. São Paulo, Brazil. Orchids, begonias.

EUROPE

Royal Botanic Garden. Edinburgh, Scotland. Living collections of lilies, primulas, rhododendrons and their relatives. Rock garden. Picturesque site.

University Botanic Garden. Oxford, England. Ancient garden in a beautiful setting.

University Botanic Garden. Cambridge, England. Rock Garden, special Winter Garden. Mock oranges (Philadelphus) species and named varieties.

Royal Horticultural Society's Gardens. Wisley, England. Rhododendrons, spring bulbs.

Royal Botanic Gardens. Kew (Outer London) England. Many display greenhouses, rock garden, fine palm house.

GÖTEBORG BOTANICAL GARDEN. Göteborg, Sweden.

HORTUS BOTANICUS BERGIANUS. Stockholm, Sweden.

THE BOTANICAL GARDEN. Lund, Sweden.

BOTANICAL GARDEN, Affiliated with ROYAL VETERINARY AND AGRICULTURAL COLLEGE. Copenhagen, Denmark. Shrubs, display greenhouses. Accurately and clearly labeled throughout the collections and displays. (The famous TIVOLI PLEASURE GARDEN is also in Copenhagen.)

JARDIN BOTANIQUE DE L'ÉTAT. Brussels, Belgium. Attractive garden with new display greenhouses.

BOTANISCHER GARTEN UND MUSEUM. Berlin-Dahlem, Germany. Large collections of unusual living plants for study, in greenhouses and out-of-doors.

BOTANISCHER GARTEN. Hamburg, Germany. Well displayed botanical and horticultural collections. "PLANT UND BLOMEN," a combined park and garden, is nearby.

PALMENGARTEN. Frankfurt am Main, Germany. Interesting display greenhouses.

BOTANISCHER GARTEN OF THE STATE OF BAVARIA. Munich, Germany. Plantings for display and study. Fine collections of orchids and insectivorous plants. Often called the finest all round botanical garden in continental Europe.

HANBURY BOTANICAL GARDEN, "La Mortola." Ventimiglia, Italy. A fabulous private botanical garden established by the Englishman, Sir Thomas Hanbury. Just off the coast road at the very northeast corner of Italy. Because of its joint nationality and private status it has had difficult periods during world wars, and precise current information about it is difficult to get. However, too many people never heard about "La Mortola" until some years after they drove right by the place. Succulents, pines, rare and beautiful sub-tropical ornamentals from all over the world.

JARDIM BOTANICO. Lisbon, Portugal. Dominated by large trees (including Monkey Puzzle and hardy palms) set off by black and white paving. Fine view of the city (and over the Garden) from the adjacent observatory.

JARDIM BOTANICO. Coimbra, Portugal. Beautiful old garden with fine sub-tropical ornamentals. Collections of bulbous plants, conifers, succulents.

ORIENT

FOSTER BOTANICAL GARDEN. Honolulu, Hawaii. Aroids, orchids. A new national Botanical Garden for the tropics has been established in Hawaii and plans are actively underway for it.

BOTANIC GARDENS. Hong Kong. Flowering cassias.

BOTANIC GARDENS. Singapore, Malaya. Palms, rare orchids.

KEBUN RAYA INDONESIA. Bogor, Indonesia. Once the finest of tropical botanical gardens. An able and devoted native staff is still struggling to keep it open.

NATIONAL BOTANIC GARDENS. Lucknow, India. Sub-tropical ornamentals and fruits. Medicinal plants.

ANTIPODES

National Botanic Gardens of South Africa. Kirstenbosch, Cape Province, South Africa. South African bulbous plants, succulents and Proteas.

Royal Botanic Gardens. Melbourne, Victoria, Australia. Australian native plants, camellias.

Royal Botanic Gardens. Sydney, New South Wales, Australia. Palms, Australian trees.

Canberra Botanic Garden. Canberra, Australia. This new National Garden is being comprehensively planned for and developed.

Christchurch Botanic Gardens. Christchurch, New Zealand. Subtropical ornamentals, rock plants and alpines.

* * *

NEW MEMBERS OF THE FRIENDS OF THE GARDEN

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Ladislaus Cutak, Greenhouse Superintendent

Hugh C. Cutler, Curator of Useful Plants

John D. Dwyer, Research Associate

Waldo G. Fechner, Secretary of Board and Controller

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Alfred Saxdal, Rose Grower

Owen J. Sexton, Research Ecologist

Frank Steinberg, Superintendent of the Arboretum, Gray Summit

George B. Van Schaack, Librarian and Curator of Grasses

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

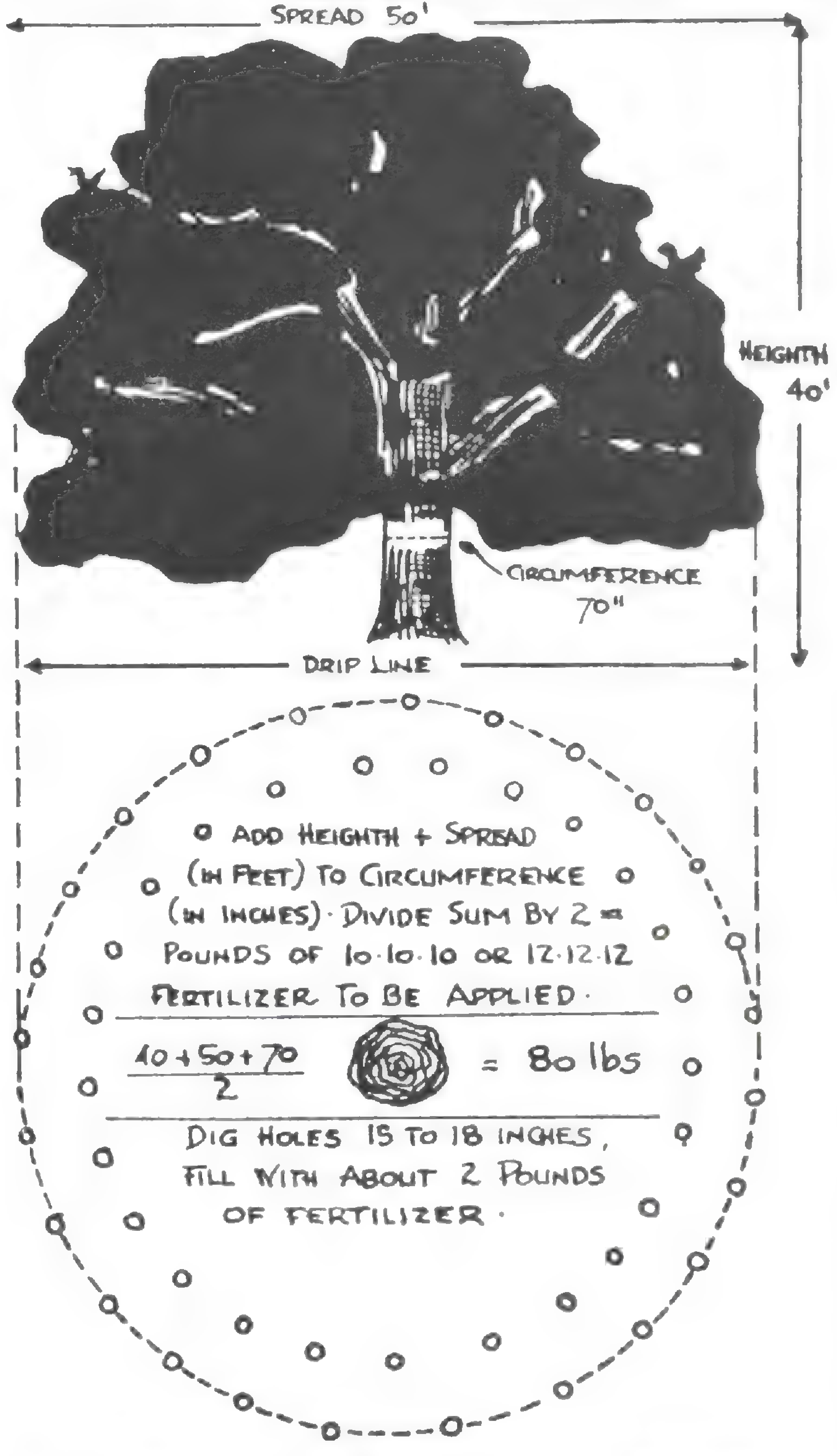
Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

March 1965
Volume LIII
Number 3


SPREAD 50'
HEIGHTH 40'
CIRCUMFERENCE 70"
DRIP LINE
ADD HEIGHTH + SPREAD (IN FEET) TO CIRCUMFERENCE (IN INCHES) · DIVIDE SUM BY 2 = POUNDS OF 10·10·10 OR 12·12·12 FERTILIZER TO BE APPLIED ·
$\frac{40+50+70}{2}$ = 80 lbs
DIG HOLES 15 TO 18 INCHES, FILL WITH ABOUT 2 POUNDS OF FERTILIZER ·

HOW TO FERTILIZE LARGE TREES

COVER: The diagram of how much fertilizer to give a tree and where to apply it was created by Edgar Denison to accompany his discussion of these matters towards the close of the following article. Mr. Denison is a man of wide interests and unusual endowments. Though much of his career at the Union Electric Company comes under the heading of Cost Research, he is now at work enlarging their Regional Museum at Tom Sauk, Missouri. He is one of the ablest and most creative gardeners in the St. Louis area and since the Kirkwood Adult School was established has taught an evening course in gardening. His article on fertilizers grows out of his experiences as a gardener and a teacher.

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Preview for Friends of the Garden

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LIII No. 3 Bulletin March 1965

FERTILIZERS — WHAT WE SHOULD KNOW ABOUT THEM

EDGAR DENISON

SPRING is here: Crocus announce it, narcissus and forsythia confirm it, and one look in the papers clinches the news—ads and more ads telling us about the wonders of fertilizers, "you will have the most beautiful lawn in the neighborhood," "Your lawn will be your pride," "You won't believe it!" Well, that last one comes close to the truth. The great mass of home owners and gardeners is almost totally lost when it comes to the evaluation of fertilizers and is in the same frame of mind as the pupil in Goethe's *Faust* after listening to Mephisto: "I am as befuddled as if a millstone was turning around in my head." And yet, it does not take much effort to lift the mysteries and to make order out of confusion.

PLANT FOOD ELEMENTS

Of the over 100 chemical elements known to man, there are at least 17 which are commonly found in plants and most of them are essential for growth and health. But only three elements are needed for plant nutrition in substantial quantities and are therefore called major plant food elements:

Nitrogen (N)
Phosphate (P_2O_5)
Potash (K_2O)

Fertilizers are either sold one element to the bag or in mixtures of the major elements. When all three major elements occur in one mixture, the fertilizer is called "complete." This designation may be misleading to the amateur because it does in no way denote a definite ratio of the three elements.

AVAILABILITY

Here we come to a most important detail in our excursion. Every container of fertilizer, be it a bag, or a sack, or a box, or a bottle, must show the amount of *available* plant food which it holds, in percent of the total weight. Availability means that portion of the fertilizer which, dissolved in water, becomes available plant food.

The percentages of availability are always recorded in the sequence of nitrogen, phosphate, and potash. A 12:12:12 fertilizer has 12% each available nitrogen, phosphate and potash. If only one element is sold in a bag, the absent elements are usually indicated by zeroes. If a sack of ammonium nitrate contains 33% available nitrogen, this will appear on the sack as 33:0:0. But at times the zeroes are not shown and the buyer is expected to know the chemical designations which represent nitrogen or phosphate. In the case of phosphate, it is always a combination of words which would contain the word phosphate such as rock phosphate, triple phosphate, or ammonium phosphate. Returning to our ammonium nitrate with an availability of 33%, we will obtain 33 pounds of available nitrogen plant food for each 100 pounds we buy. Obviously, if we buy a 50 pound bag with the same 33% availability, it means that 16½ pounds are available nitrogen fertilizer. Many people wonder why only a portion of the weight which is sold is available as plant food. Were it not for these "fillers," most fertilizers would cake into rock-like substances soon after exposure to air. Nitrogen more than other elements is capable of taking moisture from the air.

When nitrogen, phosphate, and potash are sold separately, that is, not in mixtures, considerable variation in their availability exists.

	Nitrogen Available %
Ammonium Nitrate	33
Ammonium Sulphate	20
Urea	45
	Phosphate Available %
Super Phosphate	20
Triple Phosphate	42–48
	Potash Available %
Muriate of Potash	50–62

PRICE

Those gardeners who buy a fair amount of fertilizer can certainly save much by comparing the prices of fertilizer offered by the many suppliers. Let us go to a number of stores and establishments and record the cost of fertilizers on sale and their availability. In doing just that, we detected a source from which we could purchase a great variety of fertilizers, both the complete fertilizers and the individual elements. Taking the sales prices, we can convert the cost of the fertilizer. Let us turn to the table.

At the top of the listing, we see that 33% available nitrogen can be purchased for $2.50 in 50 pound bags, which brings the price per pound of available nitrogen to 15.2¢. This unit cost can be calculated by dividing 33 into 100, which tells us that it takes 3.03 pounds of fertilizer to obtain one pound of available nitrogen. The purchase price per pound of the 50 pound sack is 5¢ ($2.50 divided by 50 pounds). Multiply the 5¢ cost by 3.03 to obtain the cost per pound of available nitrogen, namely, 15.15¢ or for our purposes 15.2¢. We can follow the same method for the phosphate and the potash.

This calculation tells us that we can buy a pound of available nitrogen for 15.2¢, phosphate for 8.8¢, and potash for 5.2¢. We now apply these "base" costs to the availability figures of the fertilizers which we have priced in the St. Louis area. The comparison of the prices in column four with those based on the prices of fertilizers A, B, and C in column five may be startling to you. One fertilizer with an availability of 23:7:7 and a cost of $4.95 for 17 pounds would cost only 76¢ if the elements were purchased separately at the prices mentioned above.

1 Chemical Designation of Fertilizer	2 % Available Plant Food N*	 Ph*	 Po*	3 Lbs. Per Bag	4 Actual Cost Per Bag	5 Cost Per Pound of Available Fertilizer N*	 Ph*	 Po*	 Total
(A) Ammonium Nitrate	33			50	$2.50	15.2¢			$2.50
(B) Triple Phosphate		46		80	3.25		8.8¢		3.25
(C) Potash			60	80	2.50			5.2¢	2.50
"Complete" Fertilizers						Value, Based on Fertilizers A–B–C			
D	10	6	4	50	$3.35	$ .76	$ .26	$ .10	$1.12
E	10	6	4	80	3.98	1.21	.42	.17	1.80
F	12	12	12	50	2.75	.91	.53	.31	1.75
G	12	12	12	80	4.00	1.46	.84	.50	2.80
H	12	12	12	50	2.98	.91	.53	.31	1.75
I	12	12	12	50	2.40	.91	.53	.31	1.75
J	6	10	4	50	2.34	.46	.44	.10	1.00
K	5	10	5	50	1.69	.38	.44	.13	.95
L	5	10	5	50	1.19	.38	.44	.13	.95
M	23	7	7	17	4.95	.59	.11	.06	.76
N	20	10	5	22	4.95	.67	.19	.06	.92
O	20	10	5	22	2.99	.67	.19	.06	.92
P	12	5	7	35	3.95	.64	.15	.13	.92
Q	20	10	5	22	4.49	.67	.19	.06	.92

* N = Nitrogen Ph = Phosphate Po = Potash

Undoubtedly, the manufacturers are entitled to some charge for mixing the elements. Mixing, however, is not essential in garden practice as the elements can be applied separately with only a slight increase in time and effort. The granulated fertilizers, sold today, are so easy to handle and are so dust free that applying them is certainly no hardship. Again, some few fertilizers are sold in pelletized form, with the objective of making them dissolve over a longer period of time. This is definitely a desirable feature, but pelletizing is expensive and you will have to ask yourself the question if you want to pay the price for this feature or if you can afford the time to make two or three applications of non-pelletized fertilizers a year instead of one but at a much lower cost. In our day, when the parting words of "good bye" have been replaced with "so long, and take it easy" any suggestion of physical work has to be questioned. Another objection to the reasoning on costs, proposed here, could be made for fertilizers which supply nitrogen in the form of urea—a highly concentrated chemical which can be easily assimilated by plants. Urea is still somewhat of a newcomer and this makes the price fairly high. It is quite reasonable to believe that the price will come down as more chemical and oil companies in this country are going into fertilizer production. In fact, the tough competition in this field shows itself today in questionable advertising claims but may well result ultimately in a reduction in the selling price. The comparison of costs shown on the table is intended to awaken your interest in the price differences which exist. It is quite possible that fertilizers can be purchased right now at even lower costs than those which were used in the comparison; the writer has neither the time nor the opportunity to cover the entire field to assemble comprehensive data.

Area Coverage and Other Problems

The sales promotion departments of the fertilizer industry have come up with a new sales approach. Instead of a simple statement on the percentages of available chemicals, we are told what area the fertilizer in a bag will cover. This is like selling you a pound of sugar, stating that it will sweeten, let us say, 100 cups of coffee. But, suppose you want very little sugar, then the same pound could sweeten 200 cups, and if you are a truly "sweet" person the sugar may suffice for 50 or fewer cups. It does not seem a proper function of the supplier to prescribe how much fertilizer we should apply. That decision depends on (a) what we want to fertilize, (b) how much or little we choose to apply at any one time, and (c) naturally, on the composition and availability of the chemicals. These decisions are yours and yours only.

To test this "area coverage" approach, we picked six different brands of fertilizer at random and jotted down the percent of available major elements and the recommended square feet of coverage per bag. Here is what we found:

Fertilizer	1 % Available Fertilizer			2 Lbs. Per Bag	3 Lbs. Available Fertilizer			4 Square Feet Coverage Per Bag	5 Lbs. Available Fertilizer Per 1,000 Sq. Ft.		
	N.	Ph.	Po.		N.	Ph.	Po.		N.	Ph.	Po.
A	10	10	5	11	1.1	1.1	0.6	2,500	0.4	0.4	0.2
B	23	7	7	19½	4.5	1.4	1.4	5,000	0.9	0.3	0.3
C	10	6	4	50	5.0	3.0	2.0	5,000	1.0	0.6	0.4
D	35	5	10	20	7.0	1.0	2.0	5,000	1.4	0.2	0.4
E	6	10	4	30	1.8	3.0	1.2	1,000	1.8	3.0	1.2
F	12	5	7	35	4.2	1.8	2.5	1,200	3.5	1.5	2.1

Let us proceed and analyze our findings:

(1) Gives the percentage of *available* plant food. "N" stands for Nitrogen, Ph. for Phosphate, and Po. for Potash.

(2) Shows the pounds of fertilizer in a sack.

(3) Converts the percentage figure of availability to pounds per sack.

(4) These are the square feet of ground which the manufacturer tells us the bag will (adequately??) fertilize.

(5) To get a common denominator, we calculate the *available* pounds for 1,000 square feet.

The results of our inquiry are, to say the least, astonishing and disturbing. Fertilizer A provides only 11% of the Nitrogen contained in fertilizer F. Fertilizer D contains one-fifteenth of the phosphate in fertilizer E. It seems obviously that these recommendations are completely unreliable if not deliberately misleading. The question of price is purposely not introduced here as it has already been discussed.

Another confusing item for the buyer is the ever changing weights of the bags in which fertilizers are sold. Only a few years ago fertilizer was marketed quite uniformly in 80 pound bags. But that is history. The higher concentration of chemical elements, the ever increasing entry of the ladies into gardening activities, and, last but not least, what seems to be a deliberate attempt to cause confusion in the mind of the buyer, has brought a steady reduction in the pounds per bag. This reduction is still going on, but it will come to an end when it has reached the "ad absurdum" stage, and we are not far from that. With the variables of (a) availability, (b) weight per bag, and (c) price, it is impossible to make on the spot decisions what fertilizer to buy economically; that takes now a little figuring and research.

How Much to Apply

Let us now discuss the amount of fertilizer which we should apply:

Lawns: In order to maintain lawns, it is essential that they be fertilized each year. Once a lawn has been established, the growing grasses will exhaust whatever fertility there is in the soil on which they grow and nature cannot replace the elements used in their growth. It is therefore necessary to give lawn areas applications of plant food in a regular pattern. It seems to be an accepted rule that to maintain a lawn, five pounds of nitrogen per year per 1,000 square foot of lawn area must be supplied. Obviously, such a general rule should not be taken too literally. On light, sandy soils and those with very high humus content, leaching is a problem and larger amounts of fertilizers are needed. These five pounds of nitrogen represent *available* nitrogen and *NOT* five pounds of any fertilizers which contain some amount of nitrogen. Under St. Louis conditions, it seems desirable to apply 2 pounds of available nitrogen in late February or very early March, one pound in early May, and the remaining 2 pounds in early fall. These recommendations assume a fairly normal rainfall and a lawn consisting of Kentucky Bluegrass in the amount of not less than 50% of the lawn community of grasses. Obviously, the application of plant food to zoysias must be related to the growth cycle of this summer grass, and would differ from that recommended for Kentucky Bluegrass.

Flower Beds and Shrubs: One of the most important considerations in fertilizing flower beds and the deciduous shrubs is that we abstain from overfertilizing at any one time, but that we should apply a complete plant food in small amounts frequently. It would be senseless to fertilize plants which either have completed their life cycle or being perennials are close to their dormant period in late fall. Shrubs and perennial plants should not receive applications of fertilizer after early July, but can be fertilized prior to the emergence of any growth in the spring. Spring flowering bulbs benefit by an application of fertilizer in early September when many of them produce roots for next year's flowers. It is my experience that a light application of a complete fertilizer casually spread by hand several times during the growing season will give good results in flower beds. It should be kept in mind that up to 40% of available plant food of fertilizers spread on the ground may be lost through the escape of gases into the air. It is always desirable to scratch the granules into the soil surface lightly to avoid their dissipation. Care must be taken that such scratching or cultivating will not damage the root systems of the flowers. When it comes to shrubs, there seems to be no established measure for fertilizing. Depending on the size of the shrubs, light to heavier applications in early spring and again in early summer seem to do the trick. As said before, when in doubt, apply small quantities of fertilizers frequently.

Trees: Trees referred to here are large specimens with a trunk diameter of not less than 6 to 8 inches. Small trees and saplings can be fertilized in the manner of shrubs (Flower Beds and Shrubs above). Large trees also need complete fertilizers and are especially grateful for nitrogen food. In the sketch there is shown a simple way of figuring the amount of a complete fertilizer which a large tree should receive. It is not necessary to fertilize trees every year. It seems best to determine the need for fertilizers by watching the tip growth of the tree branches. When this growth is less than a foot per year or when the general appearance of the tree gives the impression of "undernourishment" then a good meal will do wonders. Determine the height and spread of the tree in feet and add to this figure the circumference of the trunk, taken about chest high, in inches, and divide the total by two. The resulting figure will give you an approximate quantity of a complete 12:12:12 fertilizer which the tree should receive.

This fertilizer should be applied to the outer drip area of the branches as shown in the figure on the cover. Most gardeners seem to have a healthy respect for the effort involved in digging holes into which the fertilizer can be poured. However, this is not such a dreadful ordeal if it is done at a time when the soil is quite moist. Ideally this condition exists after the melting of a heavy snow and, while there are soil augers on the market, the writer feels that their use is far too time-consuming. Obtain a heavy iron bar, preferably 4 to 5 feet long. Such bars are frequently available from construction sites where drills have been used and broken. Any iron bar ¾ inch or 1 inch diameter will do the trick. Thrust this bar into the wet ground to a depth of 18 inches, make a circular hole of about 4 to 5 inches diameter and pour into this hole about 2 to 3 pounds of the fertilizer. The figure shows that these holes should be about 3 feet apart and if the tree needs more fertilizer than can be put into one circle move inward some 2 or 3 feet and make another row of holes. A gardener in fair physical condition and after a good breakfast should be able to dig between 200 and 250 holes in a morning, while home owners whose minds are on fishing usually do less.

Evergreens: Special care should be taken not to fertilize evergreens, both the needle and broadleaf types, in the fall. Fertilizing at this time may induce the evergreens to send out vigorous growth, but the lush, young shoots cannot sustain the rigors of the winter and are killed. Such freezing can damage a tree seriously.

Most evergreens are acid soil lovers, and we must take precautions that fertilizers used for them do not contain lime as a constituent (filler). Of course, the same precaution must be taken with all plants which demand an acid soil like the azaleas, rhododendrons, and hollies.

CONCLUSION

In conclusion, let us summarize:

(1) All fertilizing of lawns, plants, shrubs, and trees can be accomplished with the same complete fertilizer, such as a 12:12:12 formula.

(2) Remember that grass, plants, shrubs and trees will not know if the plant food was bought in mixed form or in the individual components of nitrogen, phosphate, and potash.

(3) It pays to check into the cost of fertilizers on the basis of their availability.

(4) Do not fall for sales gimmicks, such as the one which occurred recently to a Kirkwood gardener when she voiced surprise at the high cost of a fertilizer and the salesman told her: "Lady, remember this is not a field fertilizer, this is a garden fertilizer."

LOTUS LEAF CANDLES AT CHINESE FIESTAS

MORE than one gardener has looked at the handsome leaf of the flowering lotus and wondered if there were not some way in which he could make use of its unusual and beautiful shape. It is a gently flaring bowl, a foot across or more, attached to the leaf stalk at its base and so waxy that large drops of water can be spun around in it like flexible pearls. The Chinese have put it to good use for centuries. By fixing a small candle at the base of the bowl they turn it into a living lantern which gives a bright light above and a beautiful greenish glow below where the candle shines through the leaf.

The festival was held at the time of a full moon and crowds paraded along the canals and rivers carrying their lotus candles which they had bought from venders in the street. Other candle lanterns were set afloat on the waters and the whole evening was beautiful; moonlight above and flickering lights below.

EDGAR ANDERSON

STANDING IN THE SHADE OF A CABBAGE

One of the marvels of evolution is the way in which a sprawling, fleshy-leaved plant native to European seacoast has under cultivation been evolved not only into all the cabbages we know but also into Kale, Cauliflower, Brussels Sprouts, Broccoli, and several lesser known vegetables. One of these latter, "Couve Galega" (cabbage of Galicia) is such a common spring vegetable in Portugal that at the Garden we occasionally get inquiries about it from returning travelers.

Couve Galega is like the collards of our southern states (which we sometimes see in St. Louis markets) in that it does not form a head. The stem grows straight up and the well-spaced leaves are borne one at a time. It is even taller than collards, more stiffly erect, and may reach heights of over ten feet.

I first saw these skyscraper cabbages in the Island of Jersey, in the English Channel near the French coast. In that mild climate they can be planted in the early fall and grown all winter; when I saw them in June of 1914 they were being grown on a half-acre plot, sloping down towards the sea. The lower leaves had all been harvested from time to time, as green food for cattle, and the plants had kept on growing until they were well over my head; *I really walked in their shade.* The stalks were stout, about two inches thick, with scarred stubs where leaves had been removed. At the top (which was still growing) was a loose plume of a few sloppy leaves.

When well-grown stalks of this "Jersey Cabbage," as it is known in the British Isles, are carefully gathered and dried they are light in weight but surprisingly strong. Given a good coat of lacquer and a metal tip, there was a brisk trade in them in those days as souvenir canes or staffs to carry home after a holiday at the seaside.

The fact that these spiring vegetables are know in Portugal as "Cabbages of Galicia" suggests they may have persisted from an ancient culture. Galicia, that northwestern corner of the Iberian peninsula that sticks out on the map of Europe like a mop of curly hair above the startlingly human profile of the Portuguese coast, is a somewhat isolated region where ancient traits have been preserved. These strange tree cabbages, less modified by swellings than most of the cabbage clan, may well have developed there directly out of a primitive native form of this seaside species.

An appropriate name for this peculiar cabbage has been worked out by European botanists (who use a somewhat more complicated terminology than is common in American horticultural or botanical circles) as *Brassica oleracea* L. var. *acephala* DC. sub. var. *plana* Peterman forma *exaltata* Thellung! For such a plant a scientific name like "*Brassica oleracea acephala plana exaltata*" does not seem too long.

Edgar Anderson

CHOICE OF TREES

ELEANOR B. McCLURE

Priority in any planting plan should be given to trees, for they are an indispensable part of any garden picture. How, for instance, can anybody put a value on a majestic oak? It's irreplaceable, priceless. Small trees, too, can have their moments of delight, such as those unforgettable springtime displays when crabs and dogwoods are transformed into giant bouquets of bloom.

But that's not all, by any means. Trees bring more than mere æsthetic values. Tests at the University of California showed that properly placed shade trees can reduce the summer room temperature in a frame house by as much as 20 degrees. There was also a 50 per cent reduction in the hours when the house was uncomfortably warm.

For climate control on the south or east side of a two-story house it is best to plant high-branching deciduous trees, keeping them close to the building (but rarely nearer than about 18 feet). On the west or northwest exposures dense and low-branching trees are more effective, since they serve as a baffle for the western sunlight and wind.

A medium large (and costly) shade tree may prove to be a good investment for a barren lot in a treeless subdivision. It is sometimes possible to provide quick shade at a lower cost by planting three smaller trees to form a clump. Three smallish locusts or red maples, for example, are effective when planted in a single large hole.

It is a mistake, as a rule, to plant such "quick-growing" but short-lived trees as silver maples and Chinese elms. Given good care, an oak, ash or gum will grow very fast. For example, I recall two small pin oaks in Glendale that grew so rapidly in a six-year period that they caught up with two specimen trees that had been planted in a neighboring garden.

While pairs of trees are often selected to frame the house, others planted should be of many different varieties. This diversification is important, for most pests and diseases have a decided preference for a particular species. As an illustration, a leaf roller that almost defoliated all shingle oaks one summer didn't touch any other oak trees.

One reason for the rapid spread of diseases among elms and sycamores has been that row upon row of these trees have been planted along St. Louis streets, and in gardens as well. In place of the American elm many nurseries now plant the hackberry, a tree which has a vase-like form and will thrive in almost any spot.

The pin oak is one of the handsomest of shade trees, and it can be moved and re-established with ease. Red oaks, unfortunately, will not take so kindly to transplanting, and it is difficult indeed to move that fine artistocrat, the white oak.

The popular sweet gum *(Liquidambar styraciflua)* has handsome, star-shaped leaves, but the seed pods may be objectionable on lawns and walks. The black (or sour) gum *(Nyssa* *sylvatica,* which is no relation) is one of the finest possible shade trees. Since the sour gum resents transplanting, it is best to buy a small balled or canned tree for the garden.

The tulip tree *(Liriodendron tulipifera)* is another fine and long-lived shade tree (even though it is a bit brittle, being a member of the magnolia family). Given a good site, it grows tall and has a majestic spread. The fragrant greenish blooms of springtime are followed by decorative seed pods that last through the winter.

Both the white ash *(Fraxinus americana)* and the blue ash *(F. quadrangulata)* are tall, spreading trees when grown under proper conditions. Young trees should be fed and watered generously to build up their resistance to borer attack.

Among maples that can be highly recommended are the red maple, the Schwedleri maple, and the Norway maple *(Acer platanoides)*. One of the handsomest of all is the sugar maple *(A. saccharum)*, a slow-growing tree that is worth waiting for.

Members of the basswood family (which includes both American and European lindens) grow very tall and usually develop into rounded, low-branched specimens with exceptionally dense foliage. They must therefore be given ample room, and care should be taken not to plant them too close to buildings or terraces.

For sake of diversification—and greater interest—it may be advisable to buy small balled or canned trees. It is sometimes possible to find copper or purple beeches, which are slow-growing trees that acquire incomparable beauty as they mature. The gingko, with its decorative fan-shaped leaves also grows slowly, but it is remarkably healthy and long-lived. Sometimes called a "living fossil," the gingko has now outlived its enemies.

The various horsechestnuts *(Aesculus hippocastanum)* are spectacularly beautiful in the spring, when branch tips bear flower clusters that resemble fat candles and may be white, yellow, pink, or even purplish in color. The pagoda tree *(Sophora japonica)* has fine foliage and is also remarkable for its showy panicles of creamy white flowers in early summer.

Shade and screening as well can be provided by many of the ornamental flowering trees, particularly when they are planted beside the low ranch-type or contemporary house. Both crabs and magnolias, for example, can be headed high to make an arching canopy of green.

Although the huge flowers of the tulip or saucer magnolia *(M. soulangeana)* may be nipped by a late freeze, this tree is truly beautiful when in bloom. Indeed, it deserves planting for its handsome "architecture" as well, being distinguished by fine branching and twig formation. Moreover, the magnolia thrives under difficult city conditions, as demonstrated by many fine specimens that adorn Lindell Boulevard in St. Louis.

The dogwood is such a favorite that it needs little introduction. Available now in the double form *(Cornus florida plena)* and in such named varieties as White Cloud and Cherokee Princess (white) and Cherokee Chief (so-called red). It is sometimes difficult to get a dogwood established, since the trees suffer so much during drouth but will die if over-watered. They should be given the best possible care (plus insecticide treatment on the trunks) to ward off attacks of borers.

The native redbud *(Cercis canadensis)* blooms with the daffodils and early tulips. A rare white variety, *C. canadensis alba*, produces such masses of pristine white flowers that it is one of the most beautiful trees in the garden. It usually develops a handsome, symmetrical form and has superior, disease-resistant foliage.

By any standard, crabs should get a high rating, excelling in beauty, usefulness, and reliability. They should be selected for color of flowers and fruits, as well as for habit of growth and size. When planted in an open, sunny spot, they tend to make wide-spreading, round-headed trees. If they are partly shaded or in competition with nearby trees, they may grow 25 or 30 feet tall.

Two dwarf crabs that make shrubby growth are the fine Sargent crab, which has pure white flowers and small red berries, and Bob White, a winsome tree with pale pink-to-white blooms and yellow-orange fruits that persist into autumn.

Among taller varieties: *zumi calocarpa*, with red buds, white flowers and shining red fruits; *baccata jackii*, which has fragrant white flowers and cherry-like fruits that persist into winter; Morden 547 crab, an "improved Hopa," with bright pink flowers, scab-resistant foliage and purplish red fruits; *floribunda*, with pale pink flowers that fade to white; Katherine, which has bright pink buds and double blooms in pale pink; *atrosanguinea*, with bright pink flowers; and the new Radiant crab, which produces an abundance of small pink flowers and has glossy half-inch crimson fruits that provide food for the birds in winter.

THE MEDLAR *(MESPILUS GERMANICA)*, DR. SAMUEL JOHNSON'S STANDARD FOR WIT

MEDLARS have been domesticated in Europe since prehistoric times but are still one of the rarest and least known of the world's fruits, as well as one of the strangest. They are closely related to apples and hawthorns and are borne on crooked, scrubby little trees with leaves somewhat like apple leaves but less graceful and slightly larger. The flowers (and hence the fruits) are borne singly at the tips of short branches of the current season's growth. They are white and much like those of apples and quinces but differ in being backed up by conspicuous calyx lobes.

When medlar fruits are ready to harvest they still have an unfinished look. They are like small knobby green apples; those of the named varieties can be over two inches in diameter. The flesh of the fruit does not grow up all the way around the core as it does in apples or pears so that in between the scars or dried remains of the calyx is a messy little crater in which one looks right down into one end of the core.

Even when ready to harvest in late autumn, medlars are not yet ripe enough to eat. After they are gathered they must be laid out in a cool dry place to be "bletted," really a kind of controlled rotting. The flesh gradually becomes a reddish brown with a distinctive aroma. It is somewhat like the over-wintering fruits of seedling apples in old New England pastures that Thoreau described in his essay on wild apples. He found that as they thawed out in late winter, they were interesting and refreshing to taste as one tramped homewards after an afternoon's walk.

When the bletting process has proceeded just far enough, medlars are ready to serve individually on little fruit plates as an unusual ending to a heavy dinner. They are mellow and distinctly tart, slightly astringent; something like a sour dried apple trying to be a prune.

The books say that medlars are also made into fruit preserves. I have never tasted any but I have had preserved loquats from subtropical Los Angeles. They taste enough like medlars that homesick Englishmen sometimes refer to the loquat as "the oriental medlar."

Dr. Samuel Johnson used the medlar to point up one of his characteristic sallies. A gentleman under discussion was addicted to telling the kind of stories not traditionally suited to mixed company. Johnson summed him up by declaring, "His wit is like a medlar; it is never ripe until it's rotten."

EDGAR ANDERSON

* * *

THE Première of *My Fair Lady* on the evening of January 21st was an outstanding success, netting a profit of over *twenty thousand dollars* to the Friends of the Garden. The special dinners planned in connection with the event, the young people in Covent Garden costumes, the special decorations, all added an air of festivity to the magic of the play itself. George Bernard Shaw joined hands with Henry Shaw. Seldom have so many people been so pleased over parting with so much money.

* * *

PREVIEW FOR FRIENDS OF THE GARDEN

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

April 1965
Volume LIII
Number 4

1889

Cover: A single leaf of Oak-Leafed Lettuce pressed and dried by Dr. Whitaker to illustrate its shape and venation. Since 1946 when as a Guggenheim Fellow Dr. Whitaker spent a semester as a visiting member of our staff, he has been a frequent visitor, using our library and conferring with Dr. Cutler and Dr. Anderson. He has long been in charge of the Vegetable Research Station of the U.S.D.A. at La Jolla, California. He has an international reputation as a vegetable breeder and an authority on lettuce and on cantaloupes and other cucurbits. In the following article he has assembled what is known of the history of Oak-Leafed Lettuce, whose merits for the home garden in the Middle West were called to public attention by the Garden in 1943 after a long period of undeserved neglect.

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Eleanor McClure, April
A Unicorn on the Window-sill
New Members, Friends of the Garden
New Life Members
Coming Flower Shows

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: Edgar Anderson

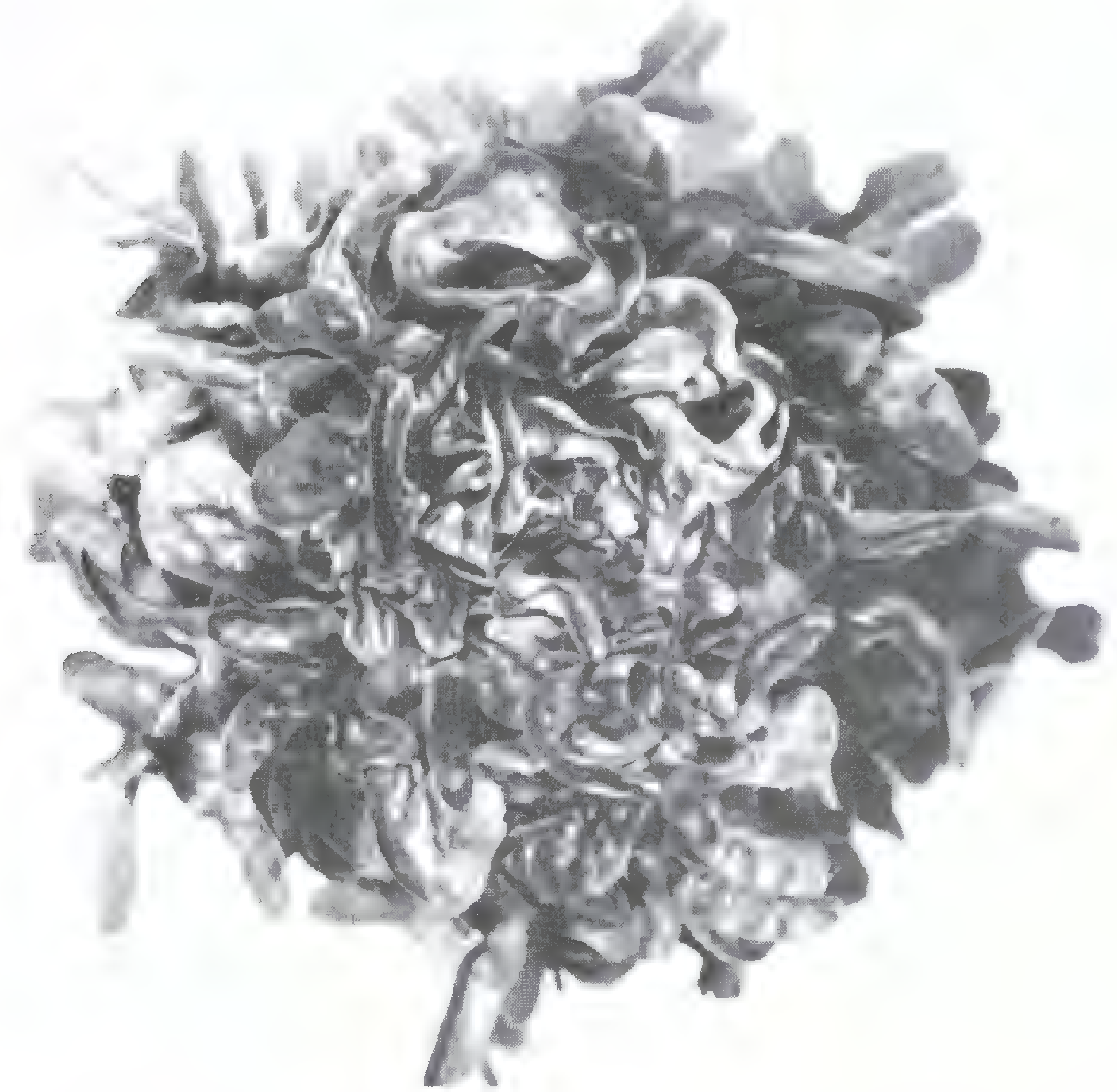
Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879

Missouri Botanical Garden
Bulletin
Vol. LIII No. 4 April 1965

OAK-LEAFED LETTUCE
A DEPENDABLE VARIETY FOR THE MID-WEST

For some poorly understood reason or reasons Oak-Leafed lettuce has been doing well in Mid-Western gardens for almost 60 years. Planted in early spring this variety will yield fresh, tasty leaves of good salad quality well into the summer. Many of the new introductions of the novelty type, such as the All-American variety Buttercrunch, are reputed to be superior to Oak-Leafed and likely to supersede it. But this prediction may be premature; Tracy in his classical work on the varieties of lettuce published in 1904 also consigned Oak-Leafed to Limbo. He reported that several varieties of the same type excelled Oak-Leafed, and seed of this variety was becoming difficult to obtain. Evidently Oak-Leafed has some



Plant of Oak-Leafed lettuce about ready for harvest. It consists of a mass of twisted, contorted leaves. (Photograph courtesy of Pieters-Wheeler Seed Company).

attraction for gardeners not readily recognized by authorities. Seed of Oak-Leafed was first offered for sale in this country by the seed trade about 1885. There is, however, no record of its prior history or origin.

Lettuce varieties are classified into 4 groups: (a) crisp-head, (b) butterhead, (c) cos or romaine, and (d) loose-leaf. Oak-Leafed is in the loose-leaf category since it does not form a head. The leaves, however, have a buttery, pliable texture similar to the butterhead varieties, for example Big Boston.

Plants of Oak-Leafed form a compact, twisted, symmetrical rosette of leaves, 6" or more in diameter, huddled close to the ground (see photo). The individual leaves are smooth, with entire margins, and are deeply lobed to resemble an oak leaf (see cover). The plants are light green, but may become intensely dark green under some conditions. The variety is slow to bolt, and this may be one reason it has found favor with gardeners. Under some conditions Oak-Leafed tipburns easily; otherwise it is generally free from diseases. The variety has white seed. For home gardeners in the area surrounding St. Louis it is probably one of the better varieties of its class, if planted in season and well grown.

THOMAS W. WHITAKER,
U. S. Department of Agriculture,
ARS, Crop Research Division,
La Jolla, California.

APRIL BRINGS THE RUSH SEASON

ELEANOR B. McCLURE

THE springtime gardening rush season comes to a peak in April. Deciduous shrubs and trees are working double shifts to produce new-minted leaves. Flowering peaches, crabs, redbuds and dogwoods turn into great bouquets of bloom. There are flowering bulbs galore, for this is the month of daffodils and early tulips.

For the gardener, too, it is often the busiest month of the year. To begin with, there's the task of feeding and grooming established plantings. Then the April planting season is a favorable time for setting out new trees, evergreens, shrubs, roses, and perennials.

Let's start with the grooming. Many evergreens can be pruned and shaped this month, just as the new buds are starting active growth. These "bud-indicators" make it easy to distinguish live wood from damaged branches. However, if there's any doubt, just scrape off a bit of the outer bark to see whether the tissues beneath are moist and green. Dead branchlets tend to be brownish, and they snap off easily.

After the dead wood has been trimmed away, the plants may need additional shaping to restore symmetry. Shearing off the branch tips will give the "go" signal to two or three adjacent buds. This will produce denser, handsomer growth on evergreens like yews, boxwoods, and hollies. Various kinds of junipers (including the popular Pfitzer juniper) are also improved by judicious shearing and shaping at this season.

If roses have not been cut back before, they should be pruned just as the new buds plump up. Be sure to make the cut just above a husky live bud, selecting one that is growing on the outside of the cane, for the branch will then go in that direction. By encouraging this outward growth, you can have a better shaped plant. It will be stronger, too, for the leaves can then enjoy ample sunlight and improved air circulation.

Any remnants of last year's perennials should be cut off and burned. Check the plants, also, for signs of heaving, a result of winter freezes and thaws. If the roots of plants like columbines and iris are nearly out of the ground, don't try to lift and replant them. Instead, just cover the exposed roots (but not the crowns of the plants) with a humus layer of partly rotted leaves or compost. Lacking this, make a light soil mix of about one-third each of loam, peat moss, and perlite. Given this assistance, the roots of most perennials have a remarkable capacity to bring the plant back to just the correct depth.

Following this general shaping and grooming, the next and very important step is to feed the entire planting. A generous sprinkling of a balanced chemical fertilizer should be applied over the entire root area of a plant (as indicated by the spread of the branches). This means, of course, that a tree or shrub gets a much larger "helping" than a rose bush or peony.

Beds of "acid-loving" plants (such as azaleas, rhododendrons, and *Pieris japonica*) should be fed with a special camellia-azalea fertilizer. We have also used iron sulphate with good results, and a light application of cottonseed meal is helpful, too. To maintain acidity, use dusting sulphur on the surface of the bed, but keep it away from the canes of the plants.

In place of the plain fertilizer applications, you might consider a special "weed and feed" formula designed to keep seeds of weeds and grasses from sprouting in cultivated beds. This may be used, for example, on beds of roses or groundcover, or in other areas where weeding is particularly onerous. There's a special preparation, too, for the acid beds.

A final feeding suggestion is that foliage fertilizers are also very helpful at this season, when plants are working overtime to produce new growth and bloom. The application can be made from a bucket or sprinkling can, but the whole plant should be drenched—leaves, soil surface, and all. For larger gardens it is better to use some sort of feeder attachment on the hose. The leaf feeding does not replace soil fertilizers but supplements them. Applications made from a week to ten days apart will be appreciated by all sorts of ornamentals. These "quick lunches" are especially helpful to roses and evergreens that are recuperating from winter damage.

In April, when the new growth starts, it is time to begin weekly spray or dust programs for roses. While sprays are somewhat more effective, it is easier to use a duster. A sturdy crank duster is a good investment, for cheap dusters often deposit globs of dust on the leaves. If the dust can be readily seen on the leaf surface, it may mean that the application was heavy enough to cause some damage to the plant.

At this season it is an excellent idea to spray or dust the crowns of many perennials, and the soil around them as well. Early protection of columbines, delphiniums, phlox, and peonies, for example, may ward off attacks of rust, rots or other diseases and help prevent the build-up of insect pests.

As the garden work progresses, planting lists can be compiled. Perennials, either bare-root or potted, can be planted at this season. Bare-root roses can be set out in early April, but later vacancies are best filled with potted roses. Bare-root shrubs and trees should also go into the ground as soon as possible. Most gardeners will feel it easier and safer to handle plants that have been balled, or grown in containers.

Container-grown stock, in particular, has been a real boon, for it is no longer necessary to compress the planting season into a few short weeks. Instead, with sound handling and after care, plants may be moved almost any time that the ground can be worked. We've even had very good luck with summer plantings.

It is possible, too, to set out plants in full bloom—practically anything from tulips and garden lilies to a flowering dogwood or crab. This is the way to "instant beauty," with a bare spot converted into a flower bed in a single day.

The ultimate success of all new plantings (including trees, shrubs, evergreens, and flowers) depends in large part on thorough and careful soil preparation. Many gardeners in the St. Louis area must contend with a tight clay surface soil that is just a few inches deep, with a tight clay hardpan beneath.

When you put the plants into clay soil like this you are virtually giving the roots a prison sentence. In poorly aerated soil, roots are unable to get the oxygen needed for "breathing" and development. Often they have trouble penetrating into the surrounding clay. Even after a year or two they may be confined in the original root ball.

It is difficult to water a clay bed, for water cannot penetrate well. On the other hand, the hardpan drains so slowly that it holds water like a bucket. While, for example, many dogwoods are damaged by drought, many others are "drowned" by overwatering.

The solution: Dig or plow the surface soil, working it at least 12 inches deep, if possible, taking care to break up lumps and clods. Spread about two inches of peat moss over the entire bed. Partly-rotted leaves or compost may be added, along with manure, if it is available. Top this mix with an inch or two of perlite (expanded volcanic lava, purchased at building supply stores under the trade name of Permalite). A generous sprinkling of either balanced or acid-type fertilizer (depending on the nature of the plants) is also needed.

All of these materials should be incorporated into the soil. This may be done by turning and spading and raking the soil. A quicker and better way is to use a garden tiller.

The bed can then be leveled and edged before planting. At first it will be several inches higher than the surrounding soil, but it will settle an inch or two after the first good rain. Even so, the plants will enjoy good surface drainage.

It is easier to water a bed of this type. Roots are encouraged to penetrate into the soil. Good aeration brings needed oxygen. Plants enjoy an ample food supply, too, thanks to the abundance of organic matter. Particles of peat, compost, and the like have the capacity to absorb soil minerals and to release them slowly to the plants.

A UNICORN ON THE WINDOW-SILL

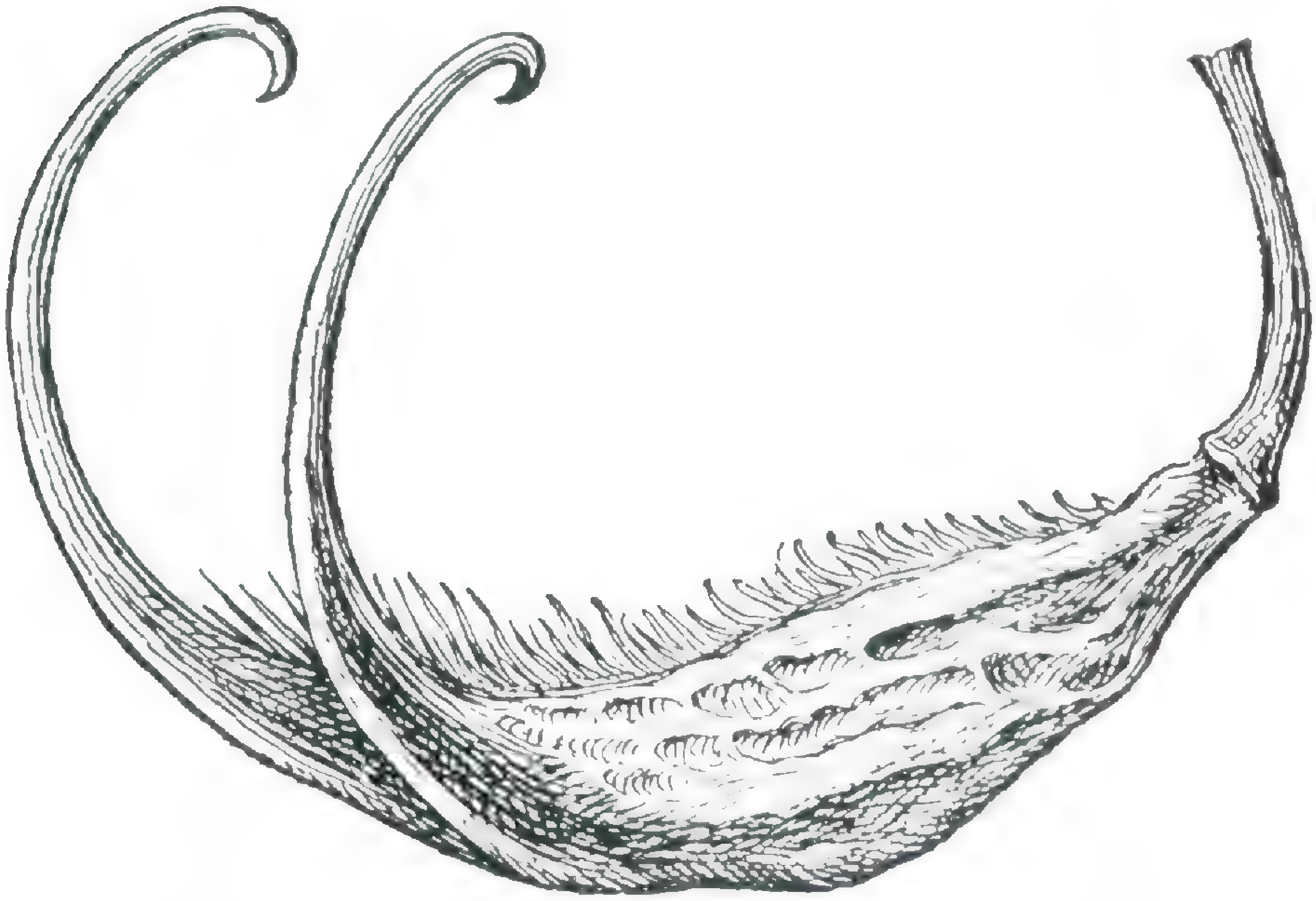
When the phone rings at Shaw's Garden one never knows what sort of a request it may bring. One of the most interesting was from an eighty-year-old lady with a quavering voice but a keen interest in her house plants. They mean a lot to her now that she doesn't get about as easily as she used to and recently she had been interested and somewhat puzzled by a volunteer seedling which came up in the same pot with one of them. It was like nothing she had ever seen before and she hoped we could tell her what it was and how it got there.

She was a good observer and her description satisfied me that we were dealing with no ordinary greenhouse weed. "It has little leaves," she told me, "a little bigger than a dime and shaped like a heart and all velvety. Some of the leaves come away from the stem all by themselves; other times they're more bunched up. It grows a little like a vine and now it has been having very pretty flowers. They're wavy little trumpets something like a small petunia, except that the pinky yellow and the purple color are more blotched into each other and the flowers have a horrid smell."

With a description as excellent as this I should certainly have been able to think what it might be, provided it had been of a plant growing in a sandy place along a road in New Mexico, but it definitely did not fit anything which might have been expected on a window-sill in Normandy, Missouri.

I was certain I could trace it down if I could see one of the flowers. Following my directions she picked a flower and two of the leaves, spread them out carefully on a bit of newspaper, and folded over the newspaper to take up the extra moisture and mailed it to the Garden. It arrived nearly dry, and all flattened out, but in almost perfect condition for identification. It was a seedling Unicorn Plant, *Proboscidea louisianica,* forced into premature bloom!

The Unicorn Plant is a strange and almost beautiful plant whose seed pod is one of the greatest curiosities in the



Explanation of the figure. The seed-pod of a Unicorn Plant, *Proboscidea louisianica* (frequently listed as *Martynia louisianica*). About ⅔ natural size. This is typical of the widely cultivated strain; in the Southwest the beak is often much longer, more recurved, and more recoiled at the tip. The Papago Indians pull out its ebony black fibres to decorate their characteristic black and white baskets.

plant world. It is about six inches long, something like a tough fibrous milkweed pod with a narrow beak as long or longer than the pod itself. As it ripens the beak splits in two and the halves curve back gracefully over the pod with hooks at their ends. They are about as wide and nearly as tough as a telephone wire. The whole contraption has the appearance of something produced in a workshop rather than grown on a plant. When stepped on by cattle, sheep or goats it catches on their feet and is carried away, spreading the ripe seeds over a wide area. With long-haired animals such as sheep and goats it may also hook into the fleece, and perhaps get an even longer ride. Because of this seed pod the plant is also known as Ram's Horn or Devil's Claws.

When grown in the garden a Unicorn Plant may cover several square feet and is something like a smaller, more ornamental, summer squash. The wavy-edged leaves may be up to a foot across and the whole plant, stem, leaves, and flower-buds, is covered with soft sticky hairs and gives off a rank odor. At their best the flowers are quite ornamental, like a small, two-lipped petunia with wavier margins. The seeds also are unusual. They are about the size and shape of an irregular slice off a pencil eraser and so jet black they look like a little piece of charcoal.

How could such a plant have turned up on a window-sill? It is native to Missouri but quite rare in the state, being occasionally found on gravel bars or along railroad tracks. South and southwestward it becomes increasingly common and something of a weed. It is grown here and there in many parts of the world by people who have an interest in curious plants. The house plant on the window-sill might have been set outdoors for part of the summer by the florist or friend from whom it came; in a garden where Unicorn Plants were grown; the compost in the pot might have come from a garden where Unicorn Plants had scattered their seeds; in some such way the big black seed got into the flower pot and eventually sprouted.

The wonder is that it should have grown and flowered though only a few inches high. The outstanding characteristic of many weeds is that they are amazingly adaptable; if conditions are not what they need to develop into a normal plant they go ahead anyway and produce a few leaves and a few flowers. But even considering all this it still seems like something of a miracle that it should have appeared and flowered in the dead of winter on the widow-sill of a house-bound old lady.

EDGAR ANDERSON

* * *

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JANUARY 1 THROUGH FEBRUARY 28, 1965

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April	4–25	Easter–Spring Flower Show
May	2–9	Lady Washington Geraniums
May	15–16	St. Louis Horticultural Society Spring Flower Show
May	29–30	Rose Show

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

May 1965
Volume LIII
Number 5

COVER: Dr. R. J. Seibert, Director of Longwood Gardens, and Mr. G. H. Pring, our Superintendent Emeritus, beside the new central water lily pool last summer in which was displayed the beautiful product of their collaboration, the new Victoria LONGWOOD HYBRID, *Victoria cruziana* × *Victoria amazonica* (long known as *Victoria regia*). PHOTO COURTESY ST. LOUIS POST-DISPATCH

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Arts and Education Fund

Quaking Grasses and Their Common Names

How to Smell a Tree

A New Trustee

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Office of publication: 306 E. Simmons Street, Gales

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Loui
Misso

Editor: EDGAR ANDERSON

Published monthly except July and August by the Board of Truste

Missouri Botanical Garden
Vol. LIII No. 5 Bulletin May 1965

VICTORIA WATER LILIES

Plants Which Stir Men's Minds

EDGAR ANDERSON

When the Garden featured the new Longwood Hybrid Victorias in our new central pool last summer it was returning to the field of its earliest triumph just 70 years ago. Dr. Trelease, the Garden's first Director, tells in his annual reports for 1894 and 1895 how the new "Victoria Pool" for tropical aquatic plants was constructed just to the south of the Linnaean House. To make these plants grow as they do in the tropics the water was heated by a pipe from the same boiler which heated the Linnaean House and the water was kept in circulation mechanically to keep the plants in better health.

When in 1894 Victoria water lilies bloomed for the first time in St. Louis, there was a special evening reception for prominent St. Louisans and later in the season the Garden was open to the public in the early evening to view the giant white water lilies by emergency illumination set up for the purpose. The following season (and for many years thereafter) Victorias were grown in a heated pool at Tower Grove Park which had better facilities for evening display. The specially constructed pool was most successful. All through the summer and early fall hardly a week passed without one or more flowers opening. The following year we find Dr. Trelease proudly starting off his annual report by describing the public response to the new lilies. Due to frequent newspaper references to the giant lilies so many people had turned out, that the total public attendance for the entire year had been raised by one-third!

The new Longwood Hybrid Victoria is both easier to grow and more spectacular than either of its parents. It has hybrid vigor and is brighter in color; in the St. Louis climate it does not require heated pools to develop leaves of spectacular size and elegant proportions. This new hybrid is a cross between two water lilies which have long been generally known to botanists and gardeners as *Victoria regia* and *Victoria cruziana*, though exactly how they ought to be classified is still a matter for scientific dispute to which a study of the hybrids and their descendants may contribute decisive evidence. They are perhaps two varieties of one species and it is quite possible that other varieties still await discovery. The first one introduced into cultivation has been long and widely known as *Victoria regia* though according to the international rules for such matters, *Victoria amazonica* is the technically correct name. *Victoria cruziana* has smaller leaves, with proportionately

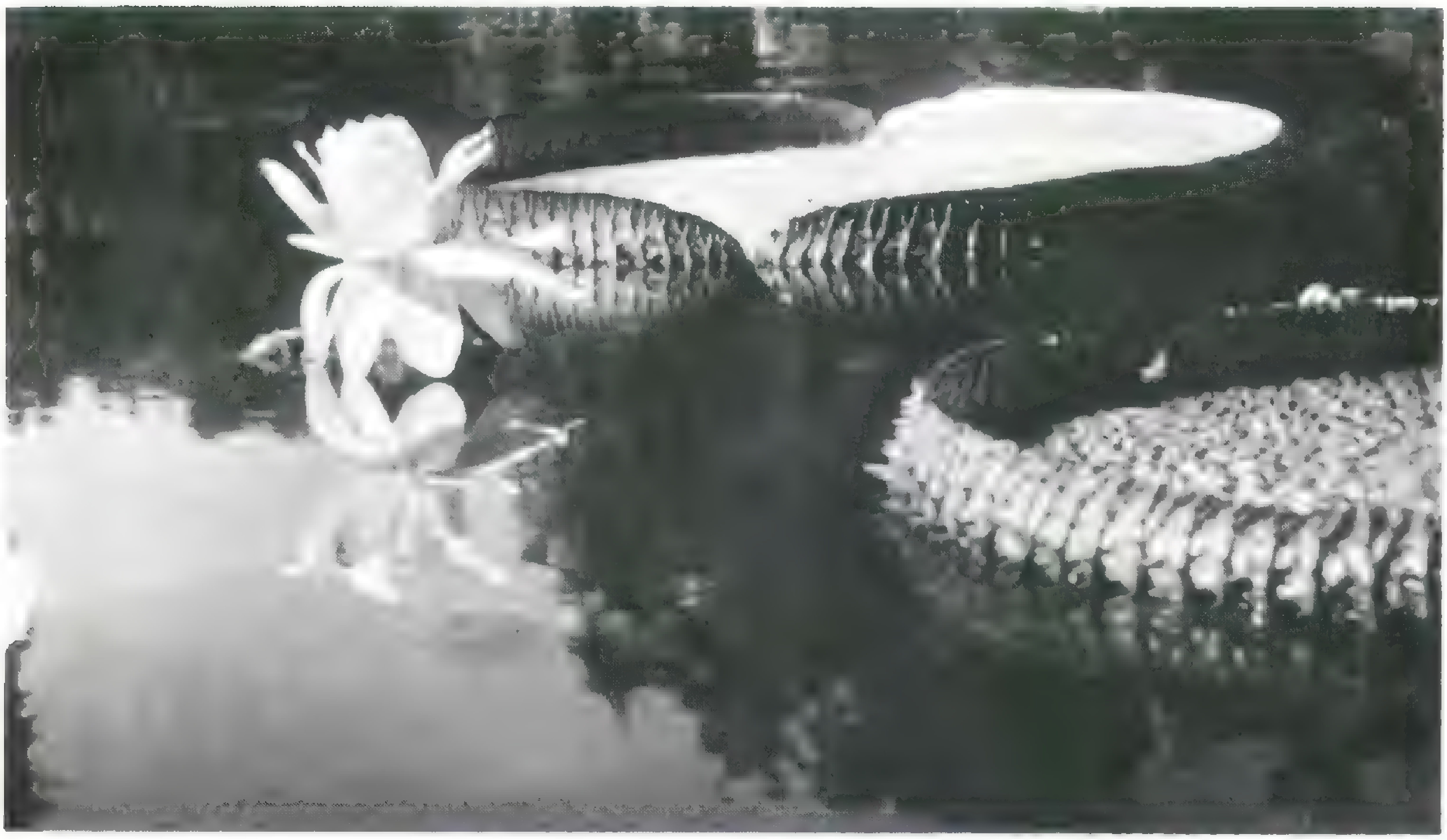


Fig. 1. A flower of *Victoria* LONGWOOD HYBRID on the second day of its opening, with one of its giant leaves in the background. The flower and the leaves are reflected in the quiet pool. The leaf at the right is still expanding. PHOTO BY LADISLAUS CUTAK

higher rims but it develops well without artificial heat in a climate as warm as St. Louis (if the pools are shallow enough for the water to be heated by the sun) and it has been grown here ever since Mr. Pring first obtained seeds of it directly from South America.

The Longwood Hybrid resulted from close collaboration between George H. Pring of the Missouri Botanical Garden and his son-in-law, Dr. Russell Seibert, the Director of the Longwood Gardens at Kennett Square, Pennsylvania. Shortly after these Gardens were opened to the public Mr. Pring was called there for four months as a consultant on water lilies. Pat Nutt, from Kew Gardens, was engaged to grow tropical water lilies and new pools were designed for a warm protected area between three greenhouses. The pools are supplied with continuously filtered water and have concrete bottoms to help in keeping down weeds. One pool was designed especially for Victorias and was heated from the adjacent greenhouse. With the heated water both *Victoria amazonica* and *Victoria cruziana* could be grown.

Both lilies grew splendidly in the new pools and flowered and set seeds. This made it practical to carry out a project which Mr. Pring (as the world's foremost breeder of tropical water lilies) had always hoped might some day be possible, the raising of a hybrid between these two lilies. One might hope for a combination of the desirable features of both parents, the greater adaptability of *V. cruziana* to outdoor pools, the much larger leaves of *V. amazonica*. There was also the possibility that the cross might have enough hybrid vigor to make it larger and more adaptable than would otherwise have been expected. If it was fertile or semi-fertile, there might be interesting new combinations among the grandchildren. Furthermore all this information would be important evidence in deciding how these giant water platters should be classified.

Pat Nutt made the crosses at Longwood, pollinating at 9:30 in the evening, using a flower of *Victoria cruziana* which had opened for the first night and had receptive stigmas, as the female parent and a flower of *Victoria amazonica* which was open for the second evening and was actively shedding pollen, as the male parent. The pollinations were made on September 17, 1960, and seed was collected (approximately 275 seeds) on October 25. The seeds were stored in moist sand for six weeks at 65° F., then six weeks at 50° F. in water. The reciprocal cross, using *V. amazonica* as the seed parent produced seed but it failed to germinate. The same original cross was repeated in 1961, 62, 63 and 64 and new plants were raised each year in nursery tanks in the greenhouses. The Victorias displayed at the Missouri Botanical Garden last summer were shipped from Longwood as young plants and held here in our own nursery tanks until the new pools were ready to receive them. In spite of being held back in this way, they did splendidly. The improved construction of the pools made it possible to feed the plants more effectively, and the concrete bottoms trapped more of the sun's heat. With the increased vigor of the hybrids and what Old St. Louisans refer to as "a good, hot summer," they throve amazingly and produced such a succession of leaves and flowers as had never been seen before in the Garden's previous Victoria pools.

The development of a new hybrid between plants which are well known to you is a fascinating thing to watch. Crosses between two species or between well marked geographical varieties are usually more or less intermediate but there are often some surprises. One frequently has not had the wit to figure out just how the two sets of levers are going to work together in making the new plant. Hybridization produces not the new but the unexpected.

Victoria amazonica has much larger leaves than *V. cruziana* but the stiff upright rims which give Victorias their distinctive charm are proportionately lower and do not develop as early in the life of the plant as they do in *V. cruziana.* These characters worked out about as had been expected. The rims were not as late in developing as in *amazonica* nor as early as in *cruziana.* The leaves were intermediate in size but hybrid vigor made them almost the size of *amazonica* leaves. The rims were intermediate in *proportion* but they were of course on much larger leaves than those of *cruziana* and rose dramatically above the surface of the water, making the plants conspicuous from a distance.

The big surprise was the color on the exposed outer side of the rim. This is dark pink in *amazonica,* and greenish in *cruziana* with the red pigment restricted to the very edge. The hybrids were brighter than either parent, a strong coppery red, one of those shades which delight photographers because it always comes out so well on color film.

To one who has studied many species crosses, such a result is not at all unique. Plants with strong color usually have strong restrictive mechanisms preventing its display in certain parts of the plant, or holding down the tone of the color.

A species with little color will have had less need of restricting color development. Hybridization with it may combine moderate color with slight restriction to produce a much brighter plant than either of the parents. I noticed this some years ago when I made hybrids between the common spiderworts of our railroad tracks and cliffs, *Tradescantia ohiensis* (which outside the flowers has so little color that it takes a microscope to find the occasional touches of red) and our rarer woodland species, *Tradescantia pilosa,* the underside of whose leaves are covered with dull dark-purple. The hybrids are brighter than either. They have bright magenta coloring spreading out from the base of the leaf and from the joints on the stems. Breeding from them one can produce brilliant spiderworts whose stems are tall wands of red magenta.

Mr. Pring and I are hoping to study such details this coming summer when it is planned to have one plant of the Longwood hybrid in the center of the circular pool and four of the grandchildren of the cross around it. The latter have been grown this winter in the nursery tanks in the greenhouse and it is already certain that they differ from each other in the amount of color, the shade of color, and the pattern of its distribution on the upper and lower surfaces of the floating leaf and the upright margin.

Victoria water lilies are native to the big river systems of South America which train the eastern slopes of the Andes and wind their various twisting courses to the Atlantic ocean. Haenke was the first botanist to find them, in Bolivia in 1801. Descriptions and fragmentary specimens came back to Europe from various naturalists. *Victoria amazonica* was found to be common in sluggish rivers and their associated lagoons, where it grew up out of rich black ooze in waters that became very shallow during the long dry seasons.

The famous Richard Spruce has left the most graphic descriptions of one of these lagoons at flowering time: "The aspect of the *Victoria* in its native waters is so new and extraordinary that I am at a loss to what to compare it. The image is not a very poetical one. When viewed from the banks above [it] was that of a number of tea trays floating, with here and there a bouquet protruding between them." The floating tray comparison must have been a common one in Latin America where wide serving trays are universally used. The native name "*Yrupe*" for these plants was first reported for the Rio Parana among the Guarani Indians, "Y" meaning water, and "rupe" being a big tray in their language. Variants of this name have been reported in various parts of South America. Translated as "water platter" it has been widely used as a common name. Thanks to English pride in their queen, however, it made little headway in competition with "*Victoria regia*" and for once a scientific name has prevailed over an excellent one in everyday speech.

In some places in South America, *Victoria amazonica* was so common that its nutritious seeds (which are borne in pods the size of a baby's head) were used for food and its Indian name meant "Maize of the Water." Bonpland has left an interesting description of its use along the Rio Pardo: "The farina made from the seed is preferred to that from the finest wheat and the ladies of Corrientes, when the fruits are ripe, obtain the seeds and extract the flour * * it's considered a luxury to have cakes of farina of the *Victoria regia*."

It was almost half a century after *Victoria amazonica* was first discovered in South America before it was grown and flowered in England. Pictures and descriptions of the fabulous plant with flat leaves over six feet across traveled back by sea mail and fragmentary dried specimens of the leaves and flowers accumulated in the world's museums. Sir William Hooker, of Kew, pieced together all the evidence and published monographic accounts illustrated with excellent colored pictures. Spurred on by the public's growing interest and anxious to procure the plant as a tribute for his sovereign, after whom it was named, he made repeated attempts to procure living plants or viable seeds. The plants died, fresh seeds would not germinate when they were mailed back dry, and rotted when they were mailed in bottles of the muddy water in which they ripened. With grim persistence he kept up the attempt and finally brought in a quantity of viable seeds by having them mailed in small lots in bottles filled with clean water. Over fifty germinated, and plants were grown in the greenhouses at Kew but finally sickened and died in the damp, poorly-lit structures then available there. Fortunately over half of the seedlings had been generously shared with growers of rare plants and four of these gentlemen (all four of them dukes) succeeded in raising the plants to flowering size.

Joseph Paxton, the gardener and general factotum for the Duke of Devonshire, by heating and circulating the water, produced a vigorous plant which bore England's first Victoria flower in the ducal greenhouse at Chatsworth on the 9th of November 1849. He reported fully ripened seeds by December of that year and grew vigorous seedlings in 1850. At Syon House, across the river from Kew, Mr. Ivison, the gardener for the Duke of Northumberland, produced flowers by 1850 and the curious leaves were exhibited at the London Horticultural Society at Chiswick. These men were soon followed by the Duke of Bedford at Woburn, and the Duke of Buccleugh at Dalkeith Palace (the first Victoria bloom for Scotland).

There is a personal account of the flowering at Woburn which is of particular interest to us because it is due to two St. Louisans (though it is probably not as reliable a source of historically accurate details as some others, since it was written by an old gentleman, recalling what he had

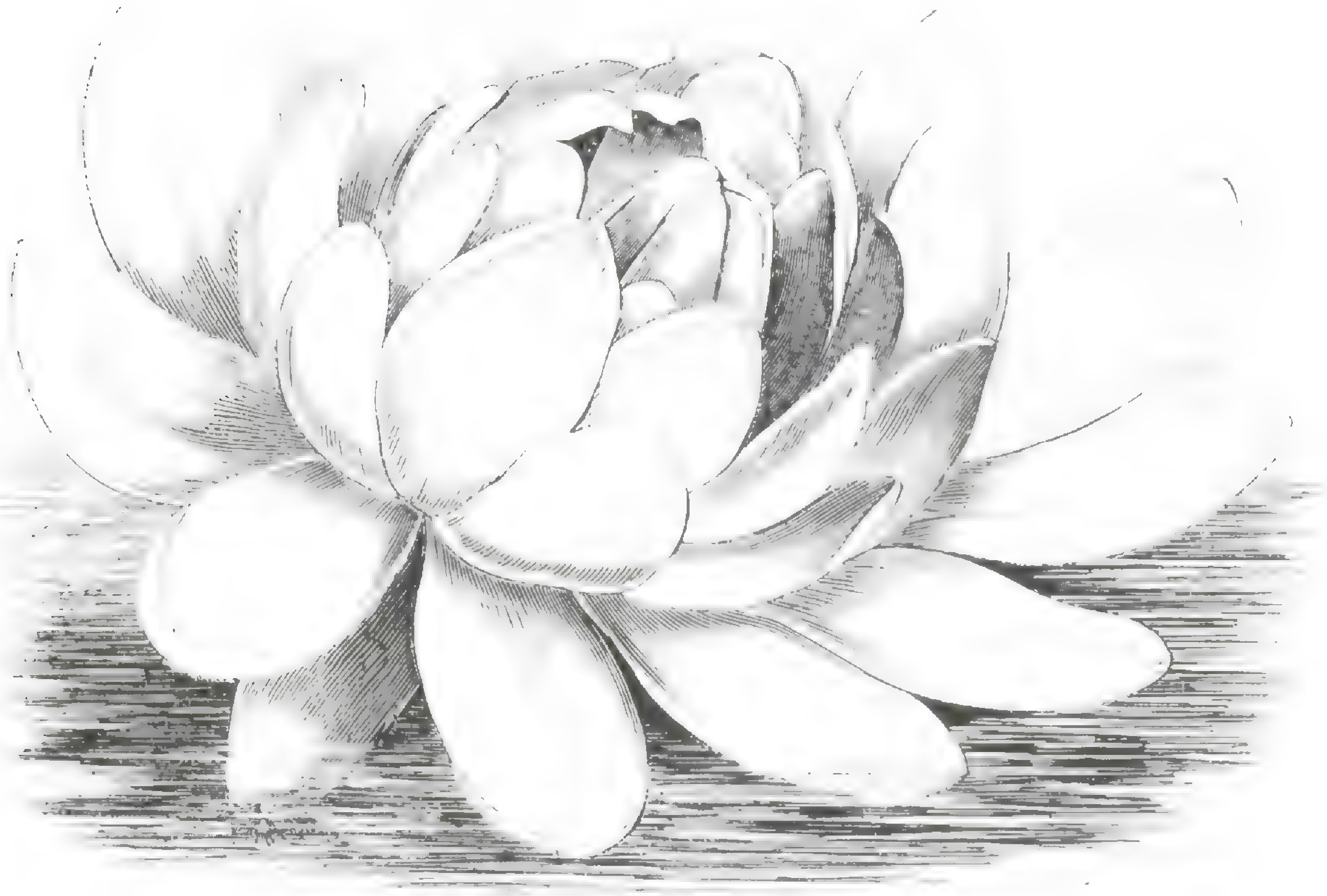


Fig. 2. "Flower of *Victoria regia* [*V. amazonica*]; as on the first day of expansion." The Gardeners' Magazine of Botany, Vol. 1, 1850.

heard from another old gentleman fifty years before he wrote it all down). J. Christian Bay, the Garden's first librarian, published in 1946 in Cedar Rapids, Iowa, a fascinating little book, "In the House of Memories." In writing about Sir Robert Schomburgk (whom he refers to as Richard) he relates the connection between Mr. James Gurney, the Garden's first Superintendent, and the history of *Victoria amazonica.* "The plant was grown in the gardens of the Duke of Bedford. The Duke handed the seed to a young gardener on his estate, James Gurney, for innumerable years later the head gardener of the Missouri Botanical Garden in St. Louis. James Gurney developed the plant and its enormous floating leaves, which will support a small child, attracted international notice and interest. When the plant bloomed, Queen Victoria, after whom it had been named, came to look at it. 'Gardener,' she said to James Gurney, 'tell me how you succeeded in producing this wonderful plant.' 'So I stepped forward,' explained Gurney; and when he told of this, one of the greatest moments in a long, blessed, and useful life, his eyes would moisten."

As soon as good seeds were available *Victoria amazonica* was flowered in the United States, where our hotter and longer summers made this much less of a feat than in England. The first American blooms were raised by

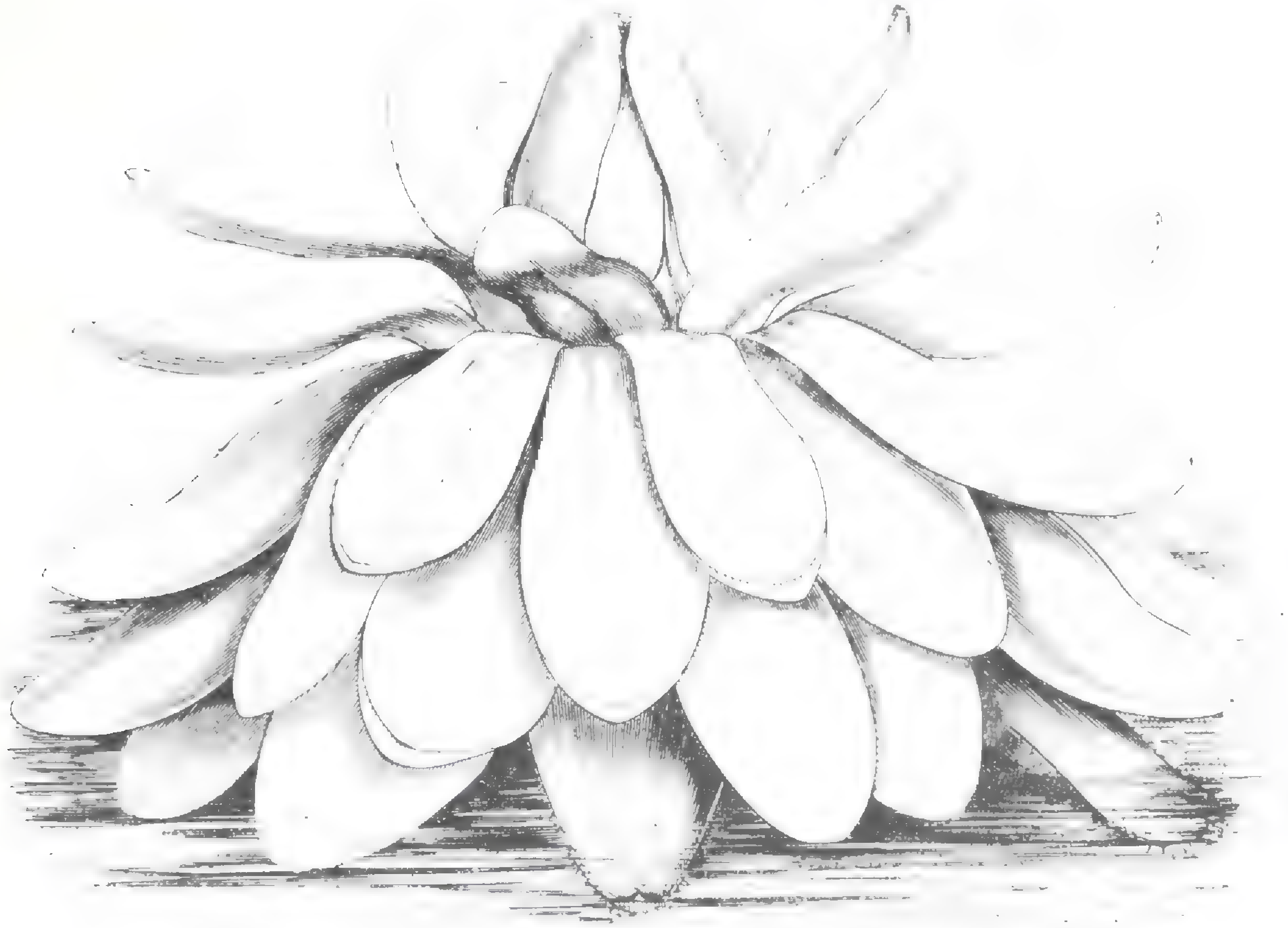


Fig. 3. "Flower of *Victoria regia* [*V. amazonica*]; first stage of second day's expansion." The Gardeners' Magazine of Botany, Vol. 1, 1850.

Meehan, the head gardener for Caleb Cope, in August 1851 at Springbrook near Philadelphia. Seeds from this plant went to Salem, Massachusetts, where they were flowered successfully by John Fisk Allen in a greenhouse with merely the extra heat trapped from the sun. With the 28th leaf, the first flower was produced on the 16th of July, 1853.

As we shall see there is something about *Victoria amazonica* which appeals to people who can make plans on a magnificent scale and carry them to completion. Mr. John Fisk Allen was so excited by his flowering Victoria that he produced the following year one of the most curious folios in the Missouri Botanical Garden Library. It is large but thin, only seventeen pages thick but 27 inches high and 21 inches wide. It gives a detailed account of the history of the lily and of its discovery with some homely details as to just how Allen grew it. There are drawings of the flower and a large colored plate, which according to the pretentious title page were made "by William Sharp from specimens at Salem, Massachusetts," though astute librarians will call your attention to the fact that the plates were obviously copied from those previously published by Sir William Hooker.

Joseph Paxton of Chatsworth was even more influenced by *Victoria amazonica* than was Mr. Allen. He studied the plant to such purpose that

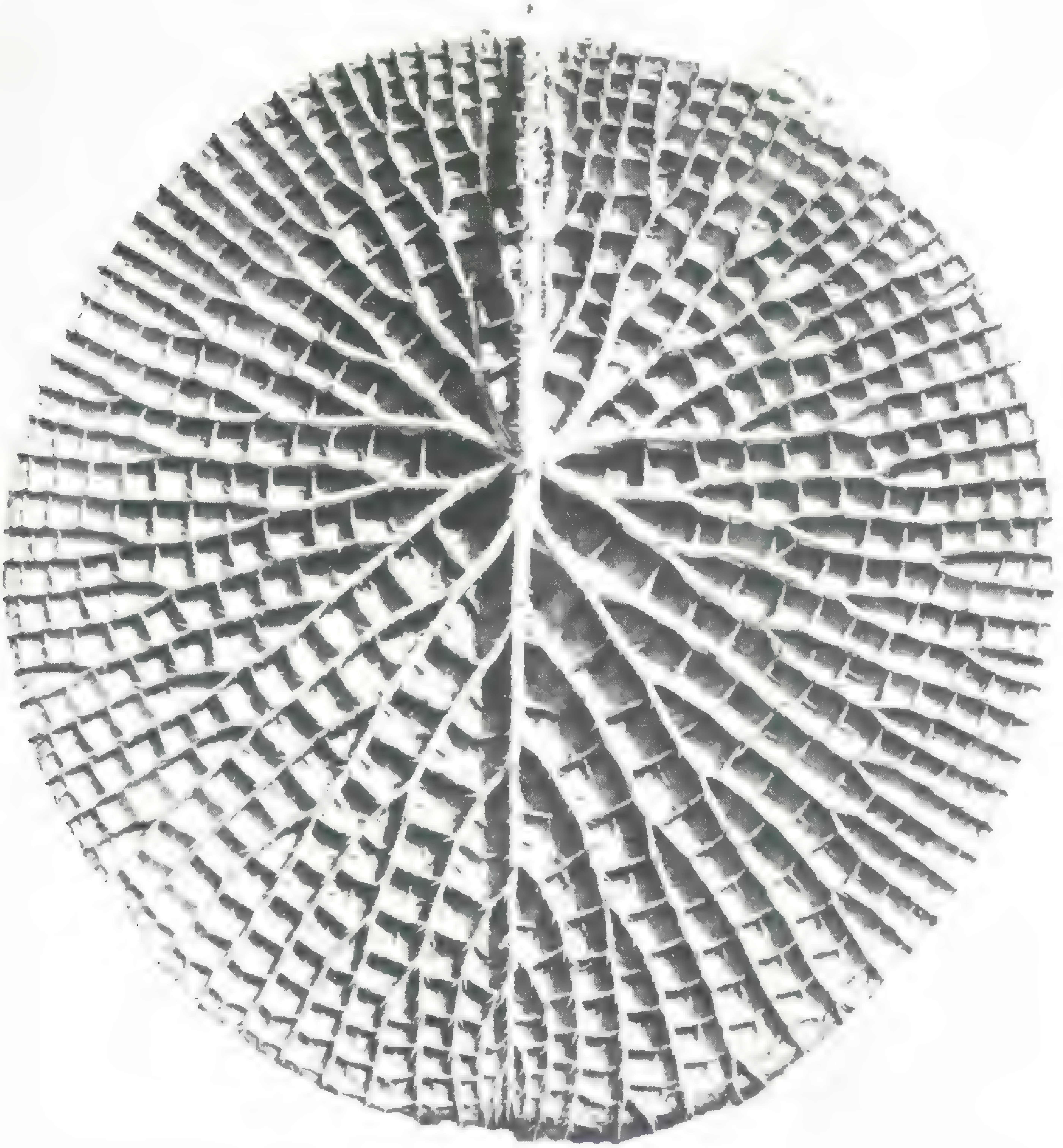


Fig. 4. The underside of a leaf of *Victoria cruziana* taken from the plant and suspended for study. Its leaf stalk runs from the upper center of the picture to the top.

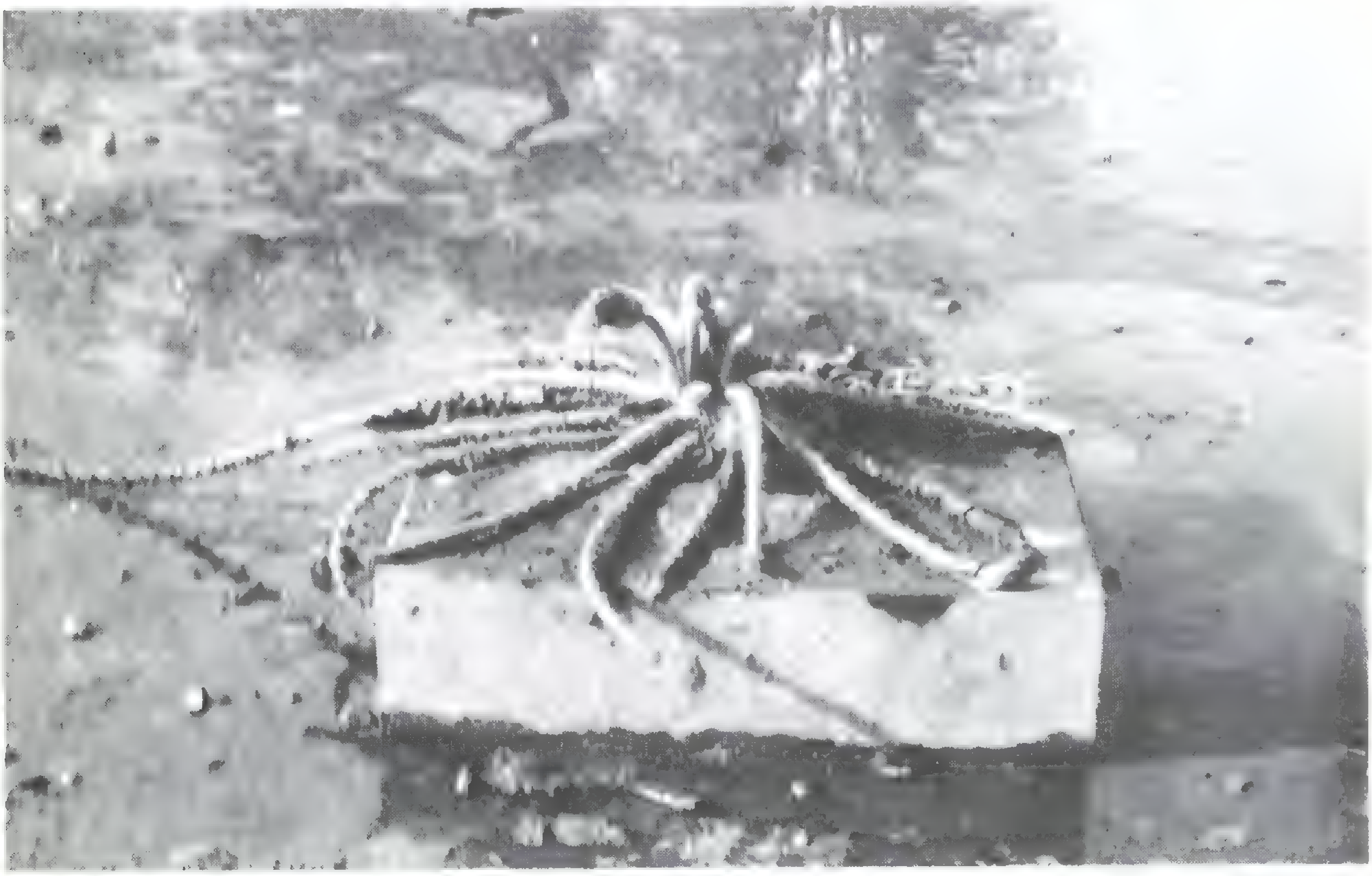
PHOTO BY PAUL A. KOHL

he revolutionized greenhouse construction, conceived and built the Crystal Palace, and advocated the designing of large buildings of a light metal framework clothed with sheets of glass, almost a full century before such structures were attempted by modern architects.

Like other reflectively minded observers, Paxton was even more impressed with the portions of a Victoria which are hidden below the water line, than with those that show above it. It is a pity that living Victorias cannot somehow be exhibited so that the public can see and study the hidden design which makes possible these graceful floating platters. Except on the upright rims, the strengthening and stiffening framework for the big leaves is nearly all hidden on their undersides. The long stout cable-like leaf-stalks and flower-stems which rise up from the bottom of the pool are on view only when the old plants are carted away in the autumn. Even then one has to cut into them with a knife to reveal the large continuous airducts which carry oxygen down to the roots. Mr. Cutak's picture diagrams the octopus-like pattern of the leaf and flower stalks. When the water was let out of the pool last fall and the old plants were revealed, he cut the old leaf blades and seed pods from one of them and posed it on top of the under-water plant box in which it had grown all summer. When one considers the scale of the picture it is remarkable that all of this plus the terminal parts which have been pruned away, should have developed from a small seed in just a few months. Another feature which is only suggested is the mantle of formidable spines with which all the under-water tissues are protected. Those on the seed pod are the most repulsive of all and Mr. Pring, after dealing with them for over fifty years, warns you that if you hit them with your bare hands "you can feel the prick for two or three days." Richard Spruce has effectively summed up his impressions when on the Amazon he first looked at these undersides: "A leaf turned up suggests some strange fabric of cast iron just taken out of a furnace; its color and its enormous ribs with which it is strengthened increasing the similarity."

When Joseph Paxton began his long association with *Victoria amazonica* he was nominally a gardener with little formal education who had become the trusted agent of a wealthy English aristocrat. Actually he was one of

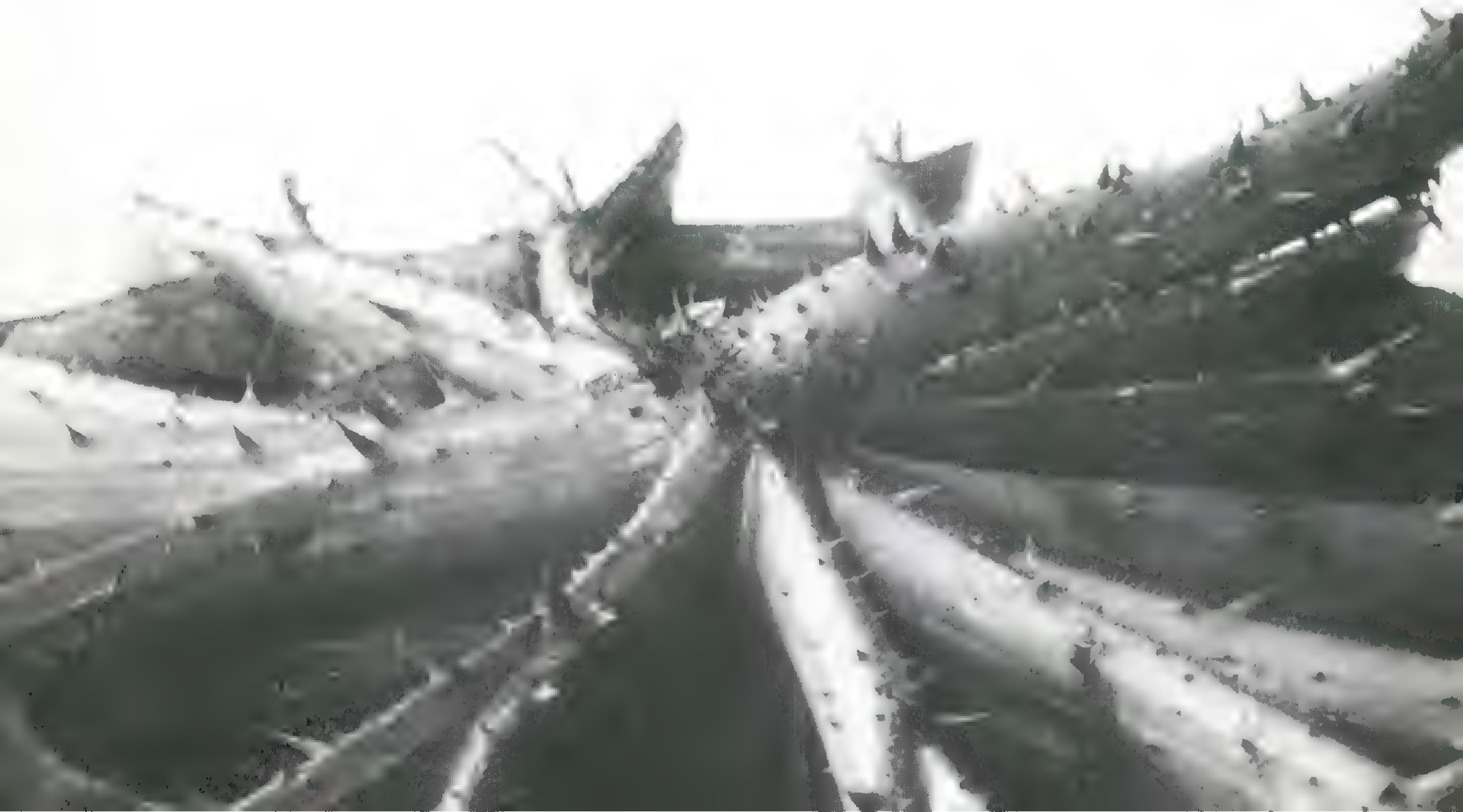
Fig. 5. An end-season view of the central architecture of a plant of *Victoria* LONGWOOD HYBRID. The leaf blades and seed pods were removed by Mr. Cutak and it was posed on top of the concrete box in which it grew all summer on the floor of the lily pool. Note the spiny covering. PHOTO BY LADISLAUS CUTAK



the keenest and most versatile men of his generation, combining a brilliant imagination with vast practicality. Recognizing his great gifts, the bachelor Duke of Devonshire had made of him a sort of traveling companion and business manager in lengthy visits to the Mediterranean. In this way Paxton acquired a command of foreign languages, a detailed knowledge of the art and architecture of Renaissance and classic times, an ability to write and speak effectively and a personal insight into the history, politics and culture of other countries beside his own. Though he remained at Chatsworth until late in life, with his tremendous energy he also wrote for horticultural publications and founded a horticultural and botanical magazine. His architectural ability was widely recognized and as a member of a firm of architects he designed gardens and estates for wealthy clients not only in England but on the Continent. This was the man whose greatest accomplishment grew out of his ability to convert an understanding of Victoria leaves into practical architectural results.

The underside of a Victoria leaf, aside from its garniture of spines, looks like a geometrical diagram in three dimensions, constructed with artistic finesse. It is light, strong, graceful and surprisingly stiff for something made of such flexible materials. The main ribs radiate from the summit of the leaf stalk, branching and rebranching with almost mathematical regularity. Smaller side ribs connect the main ones and are themselves inter-

Fig. 6. The central portion of a leaf of *Victoria cruziana* cut out and photographed at an angle to display the vein supports. Note that it is always the narrow edge of the vein which is united with the leaf.
PHOTO BY PAUL A. KOHL



webbed, and so on. All these supporting veins are much higher than they are wide (as they should be by fundamental engineering principles). Some of the smaller ones are the most dramatic. They are paper thin but extend out from the leaf for an inch or so. They are indeed a perfect design for a circular leaf supported from the center, that must be light, strong, and stiff. So I was assured by Dean Alexander Langsdorf of the Washington University School of Engineering when I took one of them to him, some years ago before I had heard of Joseph Paxton, though I was already intrigued by the implied logic of the leaf's design.

Mr. Paxton could not have had these leaves under his daily care at a more fortunate time; he was already planning to build a fine new greenhouse in which to raise such lilies to perfection and that meant it must be far lighter than any greenhouse previously constructed. He has been called exceedingly lucky, as well as highly talented. It is more probable that what looked like luck to people with slower minds was Paxton's ability to see opportunity coming down his street before she ever knocked at his door, and to be there in time to greet her and profit immediately from the news. He set out to design a new kind of greenhouse for the water lilies, using the principles of their own design to make it light in weight but strong and stable. The greenhouses of that day had begun to develop beyond the *orangeries* from which they originated, brick or stone houses with widely spaced windows and a few skylights in the roof, but they were essentially clumsy sheds with small panes of glass supported by thick wooden timbers that kept out much of the light.

Paxton conceived of a greenhouse for the big water lilies which would be strong, light, and graceful, its weight carried by slender parallel supports of iron just wide enough apart for the long panes of glass which were then becoming available from English glass manufacturers. At regular intervals between the panes were slender cross supports of wood, channeled to carry off the moisture which condensed on the glass or the rain which leaked in from outside. This water was then funneled into narrow spouts which ran down along each metal rib and carried it off. The accompanying plate shows his original plan as he prepared it to accompany his description in *The Gardeners' Chronicle.*

The new Lily House was built at Chatsworth. Victoria water lilies and other aquatics flourished in the central tanks, the Queen and her family came to see them, but Paxton soon had far larger plans afoot. Under the leadership of Albert, the Prince Consort, the Great Exhibition of 1851 was taking shape. Prince Albert was determined that it should be a cultural and recreational event of international importance. It should shake the English out of their insular smugness and make people aware of new developments in Science and Industry. The idea did not take hold quickly and the time was getting late. What was needed was an imaginative building which would take the public's fancy, furthermore one which could be ready by the time the exhibition opened.

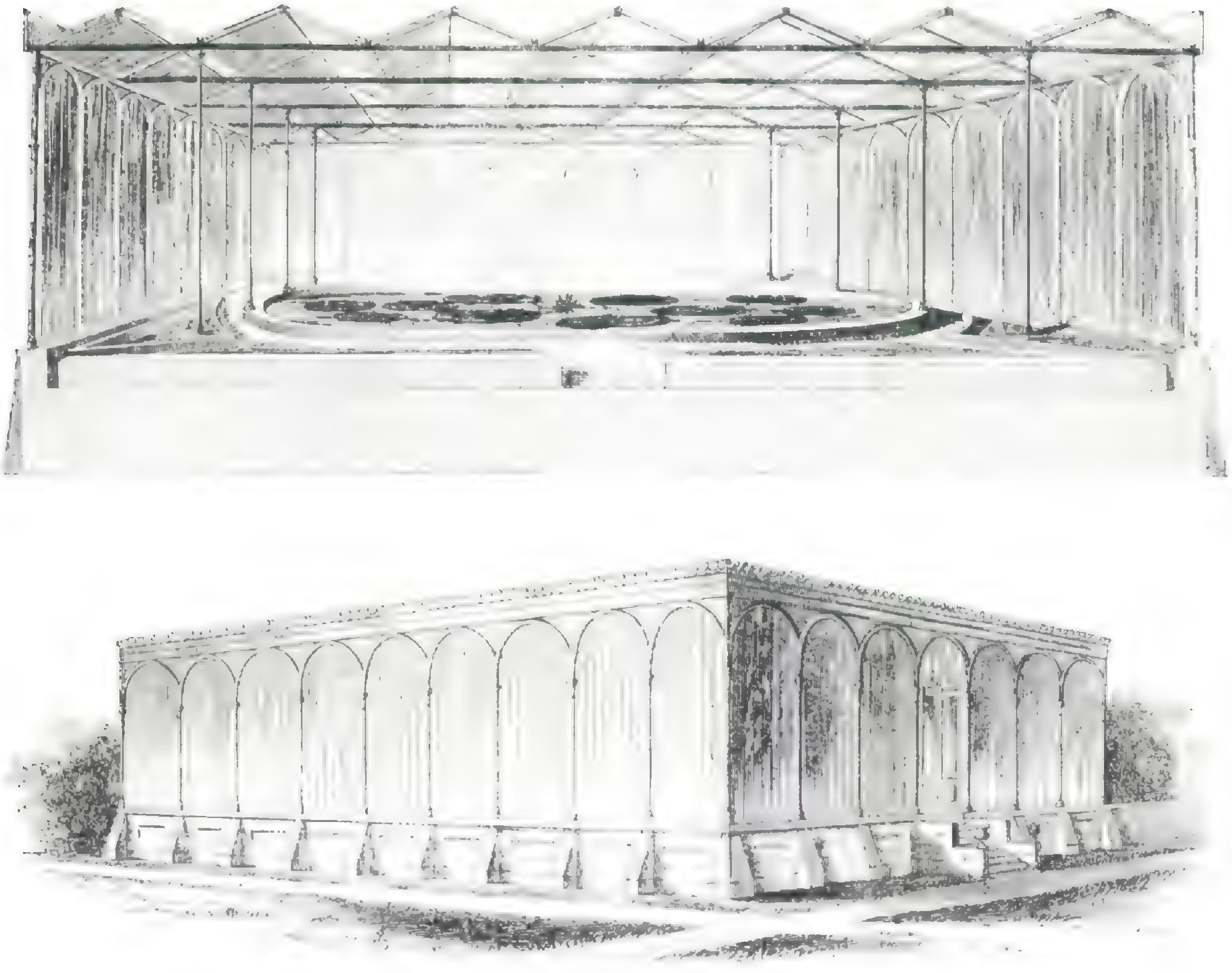


Fig. 7. Joseph Paxton's plans for the new Lily House at Chatsworth. This, the ancestor of modern greenhouses, was designed by Paxton from his analysis of the supporting system of Victoria leaves.

Paxton dreamed up the Crystal Palace, a vast hall* big enough for the whole exhibition, constructed like his Lily House at Chatsworth but in principle not unlike the hugh shells of metal and glass which developed a century later.

Paxton built his palace of glass and iron in London in Hyde Park high enough to include a large elm tree already on the site, with beds of flowering trees and shrubs to set off the exhibits and a second story promenade where one could look down on the exhibition and the huge crowds which came to see it. It gave him international fame in his day, but it did not lead to further buildings of this sort as he had been confident it would, not even after he had constructed its successor at Sydenham at the edge of London as an amusement park and concert hall. When such buildings were built his "stately pleasure dome" was forgotten and only an occasional scholar remembered his pioneer triumphs in this type of architecture. At the Royal Botanic Gardens at Kew a large Palm House was built using some of his innovations as well as a small Victoria House, so that in such ways something of his horticultural tradition has lingered on. More than any other man he set the patterns for greenhouses for a full century.

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*It covered 18 acres.

At the Crystal Palace, Joseph Paxton was able to exhibit Victoria water lilies in flower in all their glory, for it was designed for evening display. Victorias are night-blooming and like many such flowers they close during the daytime hours even during the blooming period. It is a shame that more people have not been able to see them by the unaided light of a full moon for then they are their loveliest. Seen in such a setting they are magnificently unreal and quite different from other water lilies. The first night they open, their fifty or more oblong petals are pure white and are held gracefully erect. During the next day they close up enough to have a tousled look. The second night they are tinged with pink or red and eventually turn way back, the outer ones lying on the water, forming blooms which are up to a foot and a half across. There are inner rings of stamens, inside the petals. At the very center of the flower is the complicated apparatus for receiving the pollen and attracting insects. At the very bottom of the flower is a shallow little cup filled with nectar. It is covered by an attractive rosette of outgrowths from the stigma, each one pointed toward the center.

Like most night-blooming flowers, the Victorias are fragrant. The whole area near the lily pool carries their heavy tropical scent when they are in bloom, something like a mixture of tuberoses, bananas, and ripe pineapple. Large sphinx moths are attracted to the scent and dart back and forth like small birds. After flowering, the whole blossom collapses into a wilted heap of rosy petals and soon the spine-covered seed pod ("a regular hedgehog," says Mr. Pring) gradually sinks to the bottom of the pool. Raising and hybridizing water lilies as he has for half a century he has learned much about their important underwater life. One cannot become a successful plant breeder without learning to understand the whole life cycle of the plant he is working with and its various likes and dislikes—what one might call the "home-life" of this kind of plant.

As the seeds develop, the pod increases in size and usually the chambers develop unevenly, forming an unsymmetrical pod. Part of the increase in size comes from the aril, a gelatinous tissue which grows down over its surface and makes it more buoyant. Eventually the big pods (about the size of a baby's head) rise to the surface and the sticky masses of seeds begin to push out through splits in the sides of the seed chambers. The seeds stick together and mud and bits of dead leaf adhere to them so that they look something like frogs' eggs or even like a dirty tapioca pudding. Mr. Pring believes that it is this ability to float away from the mother plants which have spread these water lilies so widely through the great eastern-flowing river systems of South America.

At the Missouri Botanical Garden the seed pods are taken into nursery tanks in the greenhouse to complete their ripening. The Victorias yield well in St. Louis. One year when they were measured they averaged two quarts of seed per plant. They are apparently as palatable and nutritious here as in South America for when the seeds were stored under water in open glass jars in the nursery tanks the rats got into them and in two nights had eaten up half the seeds. Since that time the jars have been protected with hardware cloth over the tops.

One year Mr. Pring and Joe Cutak (Mr. Lad Cutak's father) studied the viability of seed buried outdoors in the pools all winter. They were of course somewhat protected in the bottom mud of the old pools but were nevertheless exposed to alternate freezing and thawing. Tropical plants though they are they came through very well and when planted germinated in ten days, much quicker than those which had been sown indoors in the nursery tanks.

At one time, when there had been no Victorias grown in the central pool for three successive years, young plants appeared there spontaneously from seeds which had survived in the mud and must therefore have been at least nearly four years old when they germinated. It was found that some of these seeds had been able to germinate and grow up out of the mud even when buried to the depth of a foot.

Early this spring Dr. Seibert returned from South America after studying Victorias in their native home in the Amazonian part of Peru. He has supplied us with the following notes and pictures of Victorias just coming into flower and with juvenile, virtually rimless leaves. "Arrangements were made through the Universidad National de Amazonia Peruana, to observe *Victoria amazonica* growing in its natural habitat in that region of the Amazon River. This is approximately 2400 miles above the mouth of the Amazon. On January 12, 1965, accompanied by Ingo. Guillermo Cetrado, Ornithologist, and Jose Torres, Herbarium Assistant of the University, we proceeded by University launch upstream some ¾ hour to a forest trail which led, after a three-hour overland hike, to an old oxbow lake known as 'Ushpa Cocha,' about 30 km. southwest of Iquitos.

"There, on the far edge of the lake, we saw several plants of the 'Amazonian water platter.' The partly Indian inhabitant on the bank of this lake told us that the new plants were only starting to grow as the rainy season was getting started. The plants, he said, would continue to come up and increase in size throughout the year until almost the entire shallow lake a foot and a half to 3 feet deep at that time, would be covered with the large 6 foot diameter leaves. Then, about October, and in the height of the dry season as the water level went down, plants would die back and disappear until the next rainy season.

"The plants observed (see figs. 8 and 9) were obviously young, immature plants. Leaves were more than 3½ feet in diameter with their edges only slightly turning up. Searching revealed the plants to be only beginning to flower. Because of the cloudy, rainy day, the two flowers seen, one on each of two plants, were still partly open. No second night flowers were observed, nor were old flowers or maturing seed pods available for observation or collection. The two flowers and portions of the

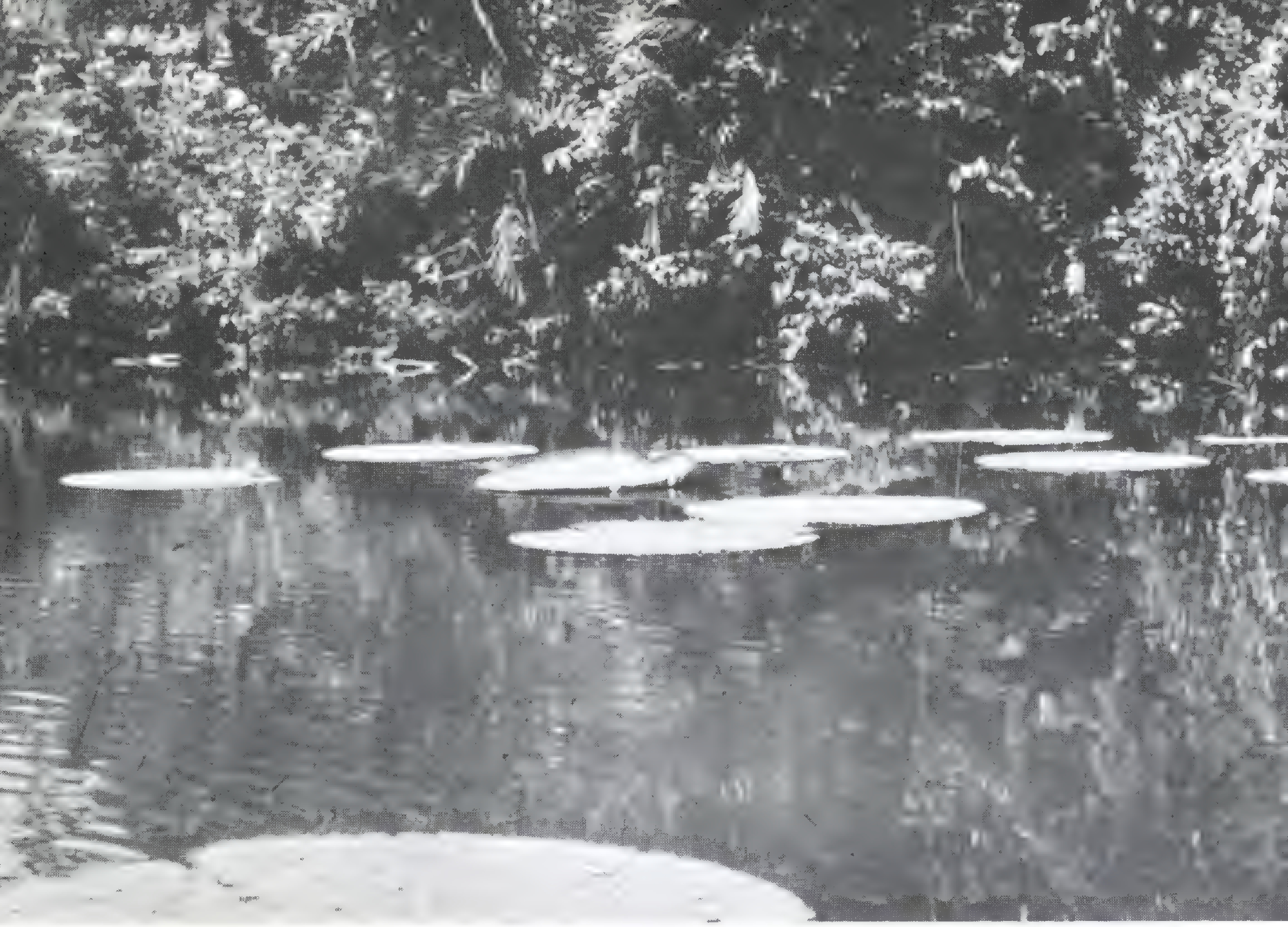

Fig. 8. Young leaves of *Victoria amazonica*, Ushpa Cocha above Iquitos, Peru, by Dr. R. J. Seibert, January 12, 1965. LONGWOOD GARDENS PHOTOGRAPH

leaves were collected for preservation in the Herbarium of the new Botany Department of the Universidad National de Amazonia Peruana. With only two first night flowers presented, there was no conclusive evidence concerning likely pollinating agents.

"Since the plants are said to start here with the rainy season as the water in the lake or 'cocha' rises, one can only surmise that the platter petioles lengthen to accommodate the water depth. The plants, according to conversations, appear to be confined to some of the older shallow oxbow lakes. These appear to be filled by the rains, with clear run-off water rather than from the rising muddy waters of the Amazon spreading out into its lower flood plain in this general area.

"One is led to conjecture as to whether the dry season lowering of the lake triggers the dying out of the colonies for the season? Or, could it be that the annual dry-season 'Friage,' a period of some 3 or so days when the weather suddenly turns quite cold with temperatures dropping to below 60° F. causes the plants to go into their annual dormancy? This question could not be satisfactorily answered by the single visit. Contacts in Iquitos have been requested to send seed during the summer. It will be of interest to compare the Iquitos strain of *V. amazonica* with plants currently in cultivation in this country."

The Victorias still raise a question with naturalists who examine their curious leaves, the same question that was raised by Dean Langsdorf when I carried a leaf over to his office for

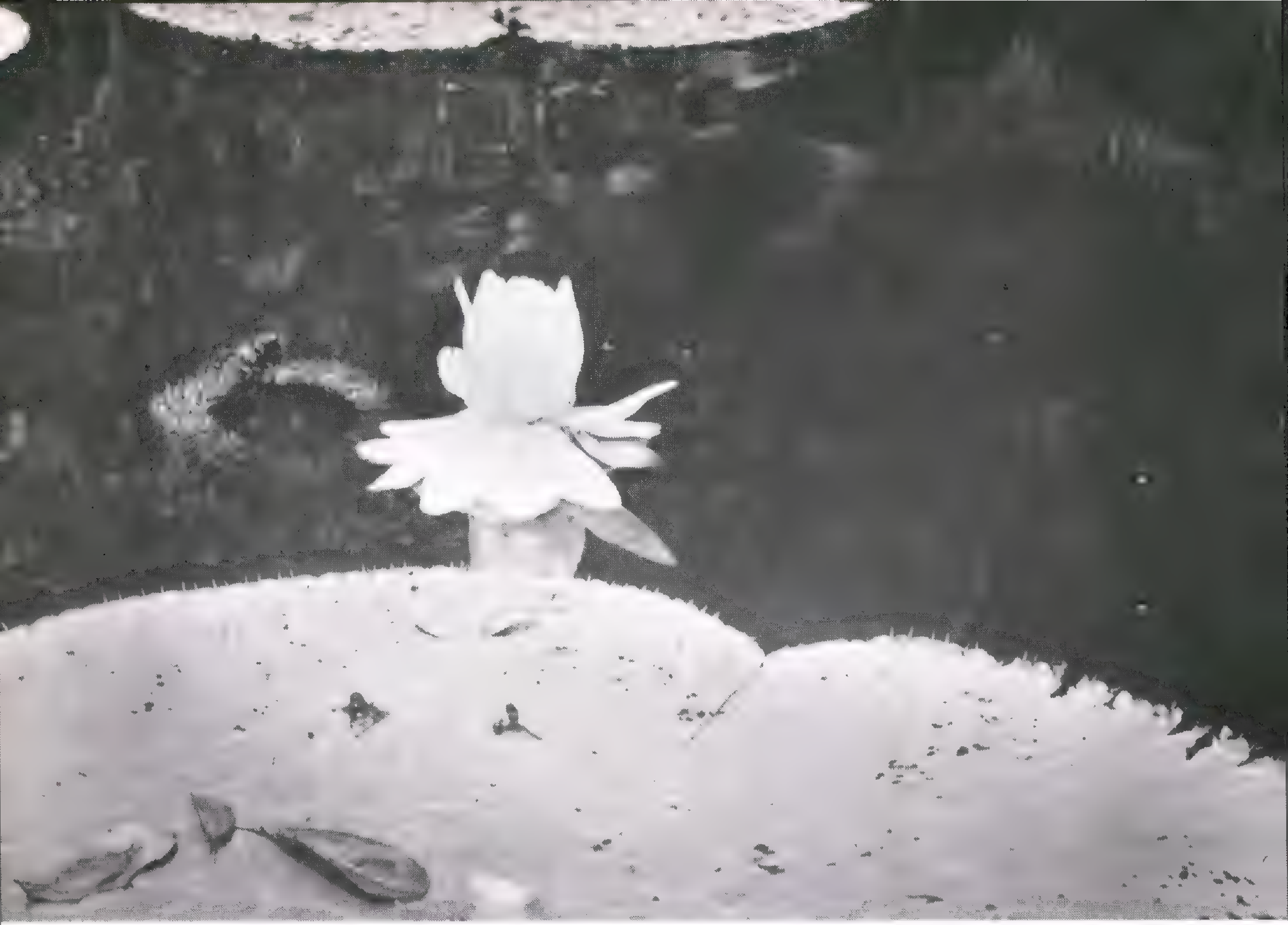

Fig. 9. Photograph of a flower and its reflection at the beginning of the flowering season, Ushpa Cocha above Iquitos, Peru. Note the spine-covered underside of the next new leaf, just beginning to unroll and mostly submerged, to the left of the flower.

LONGWOOD GARDENS PHOTOGRAPH

diagnosis. "They are perfectly designed to be strong and stiff," said he, "but why should water lily leaves be stiff?" Why indeed? Aside from the Victorias none of the water lilies are very stiff. When a strong wind blows across the pools you can see the edges being blown up and even rolled over by the wind. Increasingly I have come to suspect that it has something to do with making them attractive landing platforms for big water birds. I first got this idea when I noticed them being used this way in the Garden's lily pools. In preparing this account I have read reports of naturalists who have observed this behavior in the Amazon area and have even talked with travelers who attempted to photograph it.

It might be that the birds feed on the water snails that the lilies, like many other water plants, are cursed with. It might be that they spread the gelatinous, nutritious seeds. When the sticky seed pods come floating up to the surface the big stiff platters would make a platform from which the birds could peck at them and some of the sticky mess could easily ride away on a water-bird's long beak and travel to another river system or isolated oxbow lake. It would be an interesting problem to study in the field.

Joseph Paxton's lively curiosity about the structure of the Victoria leaf had other practical results besides influencing the design and construction of greenhouses. Impressed that such a thin and graceful leaf should be so strong (careful study with bags of sand show that a single leaf can support over 300 pounds) he used his peculiar genius for transmitting his own enthusiasms to the general public. He was himself excited about the plants; he proceeded to get England excited. He fashioned a framework of thin boards to protect the upper surface of the leaf and demonstrated that it could easily bear the weight of a charming young lady. Pictures were published of the event and one of the London journals reported that, riding on the leaf "she enjoyed a sail on the lily pond."

This began a long and continuing tradition for photographing attractive children (alone or in groups) on Victoria leaves. James Gurney carried on the custom at Woburn and introduced it in the 1890's at the Missouri Botanical Garden and Tower Grove Park.

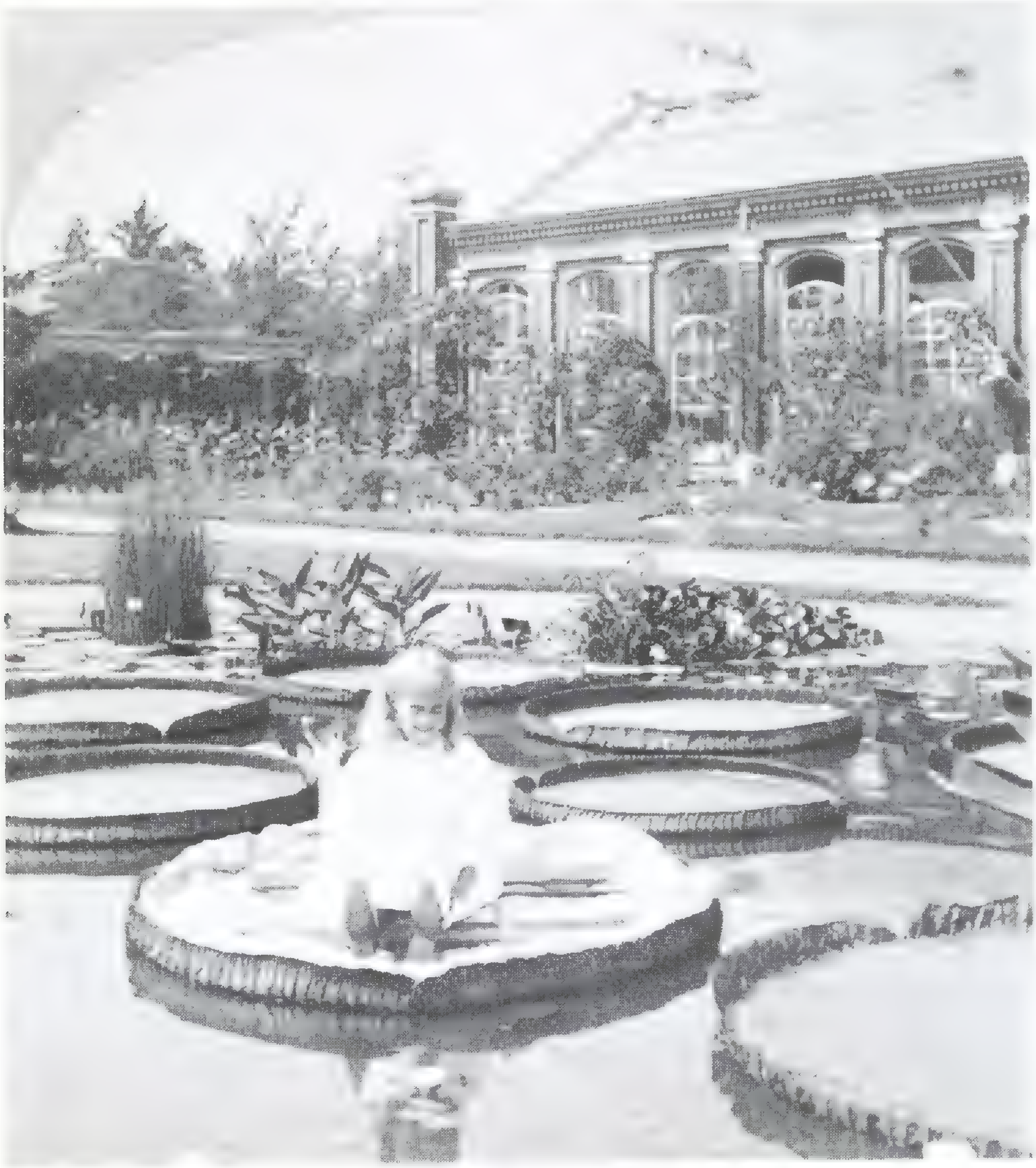

Fig. 10. View of the "Victoria Pool" in front of the Linnaean house at the Missouri Botanical Garden in the middle 1890's. The little girl is riding on a leaf of *Victoria amazonica* growing in heated water supplied by a pipe connected to the boiler which heated the Linnaean House.

Mr. Pring and Lad Cutak have perpetuated it here and now for some years the Longwood Gardens have been selling beautiful postcards of Lisa Seibert (Mr. Pring's granddaughter) riding upon a Victoria leaf. It would be interesting to know how many children have been photographed in this way; how many books, papers, and magazines have published such pictures and how many hundreds of thousands of post cards have been circulated from the various botanical gardens which carry on this Paxton tradition. One thing is certain. Many of us not native to St. Louis first heard about Mr. Shaw's fabulous botanical garden, when as children we saw one of these pictures.

One of the basic functions of a botanical garden is to acquaint all kinds of people with plants and to make them realize their importance, their wonder, and their beauty. What a miracle of understanding has in this way grown out of Joseph Paxton's ability to pass on something of his interest in the Victoria water lilies!

PROGRESS AT THE MAIN GATE

The remodeling of the Gift Shop at the Main Gate was far enough along by mid-April so that it can be kept open for the convenience of visitors throughout the summer. Its hours will be the same as those of the Climatron, 9 to 5 throughout the week and 9 to 7 on Sundays and holidays. In response to many requests from home gardeners, small bags of fir bark (used with most orchid plants) and of good potting soil are now on sale to visitors.

PLANNING FOR COLOR

ELEANOR B. McCLURE

In recent years the merits of the all-green garden have been stressed so much that it may seem a bit old-fashioned to plan for color. While it is true that the evergreen garden has an air of cool tranquillity in the summer months, it can also be too somber and monotonous. For a truly enchanting picture, flowers should be added—in pots, edgings, or wide borders.

This doesn't mean, of course, that flowers should be planted all over the garden, or that all areas should be in continuous bloom. It does mean, though, that trees and shrubs can be selected for both springtime bloom and autumn foliage color, and that strong color accents can be provided during the summer months by bedding plants and roses.

Suppose we start with a springtime flower garden that is almost certain to bloom year after year. A planting of flowering trees and daffodils will delight the amateur gardener. It will also fit neatly into the schedules of families that take long summer vacations. This nearly automatic flowering period can even be recommended for "non-gardeners" who turn to tennis, golf or boating in summer—or prefer relaxing in air conditioned comfort.

Although the springtime garden should be adapted to the site that is to be planted, it is best developed as a shade garden. For strong color masses, there are such fine flowering trees as magnolias, dogwoods, redbuds, crabs, flowering peaches, and flowering cherries.

The next step: add groupings of bulbs beneath the trees. By selecting different varieties of daffodils, it is possible to have bloom over a very long season. For landscape effect, it is best to avoid the brassy yellows in favor of pale yellows, whites (like Beersheba and Mt. Hood) or pastels (like the "pink" Mrs. Backhouse). Each variety should be planted in groupings of at least a dozen bulbs, so as to form a drift of bright bloom.

Tulips are a delight in the springtime garden, even though the bulbs tend to peter out, so that they must be replanted after a year or two. With tulips it's best to avoid garish color mixtures, and instead to plant in harmonious groupings of pastel colors—for example, rose, white and pale lilac, with perhaps an accent of deep purple.

The season of bloom can be extended if the bulb bed is given an edging of blue or white grape hyacinths. Colonies of snowdrops, crocuses or squills can also be used in a border planting.

For a final touch, a few easy-grow flowers might be added. Clumps of bluebells *(Mertensia virginica)* and wild blue phlox *(Phlox divaricata)* make fine companions for daffodils and tulips. Ajuga may be interplanted among the edging bulbs, and Blue Ridge phlox can be used to form a ribbon of pale blue bloom. A ground-cover planting of myrtle will not only provide blue flowers in the spring but also form a verdant carpet through the year.

Gardeners seeking an easy way to have long-season color might plant a background of spring-flowering shrubs and then add a border planting of tolerant perennials. For Maytime bloom there should be peonies and irises. Columbines flower for many weeks and, if allowed to self-sow, will persist for several years.

June-to-August color can be had by planting hemerocallis in early, mid-season, and late varieties. Many new hybrids are available in a remarkable color range. The flowers now have improved form, and some remain open in the evening. Best of all, they still have exceptional vigor. Even the fanciest hybrids will tolerate drouth and heat waves, and they are so disease-resistant that they need no dusting or spraying.

A few easy-grow flowers might be added as "bed-fillers." Sweet rocket *(Hesperis matronalis)* will provide quantities of white or lavender bloom over a long season in the spring. Although best treated as a biennial, this plant is very little trouble. It flowers quickly from seed, and it self-sows so profusely that it is usually necessary to weed out some plants.

The spider flower *(Cleome spinosa)* will produce large flower clusters from June to frost. Since it also self-sows generously, it will persist through the years. In addition to such colorful varieties as Pink Queen and Rose Giant, there is the delightful cleome Helen Campbell, which has large trusses of pure white flowers.

If the aim is to have nearly continuous summer bloom with a minimum of effort, room should be found for roses and bedding plants. Contrary to general belief, many roses yield a splendid show of June-to-frost bloom, and they do not need a lot of pampering. However, when seeking profuse bloom, it is best to avoid most of the hybrid teas and to make selections from floribundas, polyanthas, and grandifloras.

Among the roses that have given good performances over the years are Frensham and Carrousal, in red; Circus (yellow, orange to red); Betty Prior, The Fairy, Farmer's Wife, Fashion, Pink Bountiful, Queen Elizabeth and Montezuma (pink, rose, and coral to "orange red").

Roses must be watered during periods of drouth, of course. Most of them need weekly spraying or dusting as a protection against insects and diseases. This is most easily done with a handy crank duster, with which it is possible to protect even a large planting in just a few minutes.

For a successful display of bedding plants, the site to be planted should be carefully selected. A sunny spot is a good location for a decorative combination of pink geraniums, blue *Plumbago capensis* and white lantanas. Weeping lantanas, planted along the top of a wall, will create a curtain of lavender or yellow bloom.

Cascade type petunias grow very well and are especially attractive in urns, flower boxes or planters. The new multiflora petunias have double blooms that resemble small roses in white, pink or coral shades. They make compact plants and flower profusely, giving much better effect than older types that tend to develop long, straggly stems and few blooms.

When planting a pot or urn, be sure that it is generously large, so that the soil will not bake or dry out quickly. Good subjects for pot culture are geraniums, lantanas, heliotrope and plumbago. Since geraniums flower better in soil that is not too rich, some gardeners are now planting them in black Michigan peat, instead of soil. They should then be watered with a foliar fertilizer about once a week.

In a shaded area pots of tuberous begonias can make a fabulous display. These miffy plants need tender loving care, however, and do not belong in a low-maintenance garden. Instead, it would be better to select a more tolerant subject, such as the Angel Wing begonia, a plant that has handsome, rosy-red flower clusters and interesting foliage. It is effective when planted beside heliotrope and might have an edging of white or pink sultanas.

Various kinds of hostas are quite decorative in a shade garden. In addition to the handsome rosettes of leaves, they have attractive spikes of white or blue flowers, according to the variety. Good companions for hostas are the Magic Lily *(Lycoris squamigera)* or the rosy blooms of the hardy *Begonia evansiana.* If there is need for large, bold foliage, add groupings of caladiums, with red, white, or variegated leaves.

The Arts and Education Fund

May I urge everyone's hearty, generous, and enthusiastic support of the Greater St. Louis Arts and Education Council Fund Drive for 1965.

A terrific effort is being made by Bill McDonnell as Chairman of the Drive, with the active participation in the Drive of many civic leaders, and the assurance of many corporations of their contributing generously to make this a success.

When the Drive is a success Shaw's Garden will receive $75,000 as compared to the $20,000 received from last year's Drive.

Please help in any way you can.

Thanks!
Henry Hitchcock

ENGLAND AND AMERICA; SOME QUAKING GRASSES AND THEIR COMMON NAMES

How different is the problem of finding a common name for an interesting plant in England and in the United States! It takes time and a certain relaxed attitude toward plants for common names to accumulate. Here in the Middle West a plant can be quite common and interesting to a good many people and yet lacking an appropriate and distinctive name in common speech. In England some of the common names are older than the English language; if a plant has interesting features it almost certainly has well known names in some part of the country.

As examples let us take two grasses which, as grasses go, look not unlike each other, the European *Briza maxima* and the American *Uniola latifolia.* As summer ripens on into fall *Uniola latifolia* becomes more and more conspicuous in Missouri landscapes. It grows profusely around the edge of flood plain thickets, in dampish areas at the base of bluffs and along woodland roadways. Its pendant spikelets are broad and flat, as large as a good-sized thumbnail, and so compressed that they are only a little thicker than heavy blotting paper. They are borne in open clusters that arch gracefully out and down. The plants are about knee high, the ripening spikelets are a clear light green; along a roadway or on a ditchbank they can grow in such profusion that they look almost as if they had been purposefully planted as a border. They will stand transplanting into a flower border but somehow never look quite as graceful as they did where they were wild growing.

Many Missourians learn to know them by sight but no appropriate common name has become established for them. "Wild Oats" is listed, but it is already applied to too many grasses. The scientific name of the genus is quite attractive when properly pronounced (you-knee'-oh-la, or you-nigh'-oh-la) but there are other species farther south. One of these, *Uniola paniculata,* is a magnificent plant. It grows shoulder high on dunes and beaches from Virginia to Florida and is known as "Sea Oats." At Cape Hatteras it grows in great masses with little or no other vegetation and its stiffer, denser, more upright plumes rustle attractively in the wind. At times it has been used extensively by professional decorators for it is tough enough to stand a good deal of moving about before it begins to look shopworn. However the greatly increased uses of the sea coast for military and recreational purposes in recent years must have reduced its numbers greatly.

How different is the problem of a good common name when one is dealing with a European species. *Briza maxima,* an easily grown annual, is common in England. It is sometimes planted in American gardens particularly by those who are interested in making old-fashioned flower arrangements. Its spikelets are not quite as large as those of our *Uniola latifolia* but they are borne on even more delicate stalks and quiver more continuously. Geoffrey Grigson, in his Herbal of All Sorts (Macmillan, N. Y., 1959) has presented his collection of 69 common names found for it in various parts of England and Ireland. He suggests that the common names for the rest of Europe must run into the hundreds. Here is a selection of some of the more interesting ones on his list:

- Dithering Grass
- Doddering Dillies
- Hay Shakers
- Nodding Isabel
- Rattle Baskets
- Shivery-shakeries
- Wag-wafers
- Wiggle-waggle-wantons

The problem in writing about such a grass is which names to pick and from what languages!

E. A.

HOW TO SMELL A TREE

EDGAR ANDERSON

Many woody plants have distinctive odors which are not easy to detect, particularly when the plants are leafless and one is most in need of all possible clues in identifying a specimen. The technique of revealing these odors quickly and effectively is a simple one but few people find their way to it without special instruction.

When you stop to consider the inner make-up of a twig it's not at all surprising that trees should be able to mask their distinctive perfumes masterfully. Most twigs have a somewhat varnishy surface when they are young and somewhere below that, a developing layer of cork, a major factor in imprisoning the smell. It is the cork from the cork oak which has long been used for keeping perfume confined in perfume bottles. Cork is a distinctive tissue. It has tiny little cells, with no spaces between them, set in layer upon layer as regularly as bricks in a well. Their contents dry up quickly and their thin walls are tough and flexible. No wonder that a good bottle cork, formed solely of this tisue, can keep perfume from coming through it and also snuggle so closely to the glass bottle that very little odor escapes, even at the edges.

Enough about the general problem; now to describe a standard way of dealing with the difficulty. Use a fairly sharp knife, not a "razor-sharp" one. A good pocket knife, a simple kitchen paring-knife, or a slightly dulled scalpel are all excellent. Choose a twig from a vigorous branch if possible. Hold it horizontal with one hand and scrape the knife blade rapidly back and forth with the other. Do not try to push the cutting edge into the wood; one works with the sides of the cutting edge, not with the edge itself. Bear down gently at first and then more and more firmly as you create a relatively smooth wooden surface on which to work. When you have taught yourself the trick, it shouldn't take longer than 5 or 10 seconds on most twigs. A scraped area about an inch long with the shredded tissues of the twig piled up at either end will be sufficient. This simple technique can open up a new world of personal experience, just how large a world will depend on how deeply you are interested in plants and how keen is your sense of smell.

All the Magnolias, you will find, have a strong, aromatic, slightly varnishy scent. It is apparently distinctive of the rest of the Magnolia family in addition to the true Magnolias; the smell of a Tulip-tree twig is nearly as strong and quite similar in quality.

Everything in the genus *Prunus* has more or less of the distinctive odor of oil-of-bitter-almonds in its twigs. This genus includes all the stone fruits, peaches, cherries, plums, flowering cherries, almonds, wild plums. The odor is the strongest in peaches and in our wild black cherry *(Prunus serotina)*. The stronger it is, the more is it a danger signal, indicating that the plant has the capacity for producing cyanide under certain conditions. For some species of *Prunus* it indicates that the fruit pits can be poisonous. For the wild black cherry it means that if the branches (either fresh or wilted) are browsed upon by cattle they may die of cyanide poisoning. For parts of eastern North America this wild black cherry is the native plant most dangerous to live stock. For some of the wild plums the odor may be so slight that it will be apparent only in rapidly developing twigs. Even when it is too faint to smell, however, its characteristic bitter taste can be detected by discretely chewing a bit of the scrapings.

It is amazing how strong and distinctive an odor can be locked up in the twigs of some trees without its being suspected by many of the people who see them every day. One of the strongest is that of the sweet (or black) birch, *Betula lenta,* which reeks of wintergreen when you scrape it . . . as well it might since it is the commercial source of the best grades of wintergreen flavoring extract. Yet when I demonstrated it to an observant friend of mine who now lives in the outer suburbs of New York City, he had never noticed it before though several sweet birch trees were only a few steps from his house.

* * *

A NEW MEMBER OF THE BOARD OF TRUSTEES

At a recent meeting the Board of Trustees accepted the resignation of Bishop George L. Cadigan in order that they might, as he phrased it, "choose someone whose time and gifts would be helpful to the Garden at this time." They did so, however, only on his promise to accept an honorary membership on the Board, which will give him a voice, if not a vote, in any future decisions. To fill this vacancy they then appointed Mr. C. Powell Whitehead.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

June 1965
Volume LIII
Number 6

THE FIRST FIVE YEARS OF THE CLIMATRON

COVER: Mr. Lad Cutak, the Greenhouse Superintendent, pruning a vigorous young COFFEE TREE in the Climatron. The shiny new leaves make an effective background for the fragrant white flowers. These last for only a few days but the berries (green turning to dark red) remain for many months. They are borne in such quantities on our trees that they are almost as handsome as the flowers. Each of these pulpy berries contains two large seeds which when roasted and ground supply the world's most widely used beverage.

PHOTO COURTESY OF THE ST. LOUIS POST-DISPATCH

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The First Five Years of the Climatron
Three Calls for Volunteers

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879

Missouri Botanical Garden Bulletin

Vol. LIII No. 6 June 1965

FOREWORD

It will be five years in October since the Climatron was opened to the public. Its basic goal, to make tropical plants grow as well in the temperate zone as they do in their native homes, has been achieved more rapidly and more completely than any of us had hoped. For the past two years the vegetation of the Climatron has presented essentially the aspect of the edge of an old tropical garden which is being rapidly engulfed by the surrounding jungle. To those of us who work at the Garden it has been a privilege and a delight to visit it week by week, to come to know many tropical plants intimately and gradually to understand something of their dynamics.

As the first greenhouse of its kind, many new features of construction and management had to be designed. Some of these worked out smoothly, others had to be readjusted, a few were impractical. We have attempted to present as full and as objective an account of this remarkable building as is possible at the present time. The Garden's Engineer, Mr. James Hampton, supplied a summary of the basic mechanical details and has patiently supervised my efforts to make them more comprehensible to myself and to other people. Mr. Lad Cutak, our Greenhouse Superintendent, and other members of the staff have been helpful in putting this account together.

Edgar Anderson

THE FIRST FIVE YEARS OF THE CLIMATRON

From one's first view of the Climatron, it is evident that this is no ordinary greenhouse. A full quarter of a hemisphere, 70 feet high and 175 feet wide, it rises as a graceful dome, dramatically placed at the end of the tropical lily pools and reflected in them. Photogenic both by day and by night, it frequently has a special magic shortly before and after sunset. It is directly west of the Main Gate, so that the sun sets behind it. Since the far side of the structure is twelve feet lower than the nearer side, the setting sun can shine into it from the rear, though concealed from the observer, filling the dome with sunset light and giving an opalescent glow to its surface. On the best of such evenings the sunset in the sky and the sunset in the Climatron go through a long series of changes which are variously mirrored in the pools.

H

The arresting shape and size of the Climatron were not however something which was thought up merely to add interest to a new building. They are the indirect result of the efforts of its designers to create a building which, unlike all previous greenhouses, would grow tropical plants effectively in the temperate zone. Its basic principles were conceived by a former Director of the Garden, Dr. Frits W. Went, who worked closely with the St. Louis architects, Murphy and Mackey, in developing a geodesic dome after the principles of R. Buckminster Fuller, who also served in a consulting capacity.

Such a dome is its own support and eliminates interior framework which cuts down the light and interferes with air circulation. There are other revolutionary features as well. The Climatron is heated during cold weather by circulating hot air rather than by traditional heating pipes whose intense radiation checks the growth of many plants and bakes nearby soil. The fundamental difficulty in making tropical plants at home in the temperate zone is not to keep them warm in the winter time, it is keeping them cool in the summer time.

To grow them one must have light. Letting in sunlight brings in heat rays along with the light rays. Much of this heat is trapped inside. In ordinary greenhouses this problem is met by shading the glass with white or green paint, particularly in the summer time. This lowers the light to a point where few plants grow really well and many will never bloom. In the Climatron there is no shading. The natural light pours in and heat is controlled by constantly changing the air and by passing it through a cooling water curtain when temperatures get above 82° F.

Another way in which different kinds of plants have been fitted happily into one greenhouse has been to provide varied surface features, hills and ridges, a long shallow bog, a little round pond. These features were greatly accented by taking advantage of the unusual changes in grade already present at the site. Formerly an old-fashioned palmhouse dropped off abruptly to an Italian garden 12 feet below it. This allows us to have a really impressive waterfall surrounded by lush tropical vegetation, fed by a rock-lined brook which comes rushing down from above it along a little ridge. Standing below the falls one feels a strong current of cool damp air, just as one does at a waterfall in the tropics. Many of the plants there (as for instance the tree ferns and the various flowering gingers) grow better and more attractively than they could in other parts of the Climatron.

These differences in level suggested one of the Climatron's most distinctive features, *the warm air system* and *the cool air system* were deliberately designed to operate at right angles to each other, in order to vary the micro-

OPPOSITE: Control Panel just inside the entrance to the Climatron as it appeared when it was first opened to the public in the autumn of 1960. From this point the dome of the building is now barely visible. This panel is the "nerve center" of the building. Complete description in the text (pp. 4 to 7).

PHOTO, HEDRICH-BLESSING

climates as much as possible. In the winter, when heated air is required, much of the time it enters on the south side (to your left as you enter) and leaves at the north side. On summer days when the air is being cooled it enters on the lower level at the rear and leaves on the upper level through the big fans at the front and sides. While this system does help to diversify the plant environment within the Climatron, it does not produce four different tropical climates inside one greenhouse as it had been hoped it might. There are easily notable differences in plant responses on the upper and lower levels and less perceptible gradients throughout the structure, but the waterfall and its circulating brooks, the steep slopes of Misty Ridge with a pathway along its crest wide enough to let in more sunshine, enable us to grow many plants to perfection which would not flourish in other parts of the Climatron.

The main reason the temperature gradients have so little overall effect is the smashing success we have had in growing tropical plants really well. After a year (see pages 7 and 10) some of the largest were already imposing differences in light, air circulation, moisture and temperature on all the plants around them. By the end of the second year most of the vegetation was looking just as it does in the tropics. The unimpeded light (except for the plants themselves), the circulating air, the air moist even in the driest weather, has produced results which astounded the experts as well as the general public. Vegetation is removed by the truckload, trees are headed back, branches are lopped off, many plants (shrubs, vines, trees) are taken out entirely and the scars on the landscape are healed rapidly by lush new growth.

One is always amused in taking visitors around the Climatron to have them say, "These trees are growing so well you're going to have to cut some of them back, one of these days." The joke is that a good many of them *have been* cut back, some of them repeatedly. Since the second year of the Climatron's operation, topping tall trees, removing big limbs, cutting back vines drastically, removing other plants entirely, has been one of our main operations.

After passing through the turnstiles the first sure indication that one is in a dynamically different type of greenhouse is the Main Control Panel, just ahead at the left. It is placed here since the entrance area is less overshaded and the instruments are well illuminated. For the engineer and his assistants it is the nerve center of the Climatron. This new type of greenhouse is distinguished by its greater control—control of air temperature, air movement, water movement, illumination. This is the panel from which the engineer can quickly find out how the Climatron is operating at the moment, from which he can also get a summary of what has been happening and it is the chief center from which he controls air movement, artificial light, and temperature. Though the vegetation immediately around the Control Panel grows like a tropical jungle, an underground view of the area would show electric cables and

Assembling the dome. Note how comparatively light are the big tubes of aluminum alloy.

PHOTO, SHAW CAMERA SHOP

compressed-air lines fanning out in all directions to equipment throughout the Climatron. It takes two air-compressors to maintain the necessary air pressures for our pneumatic devices.

To many visitors the most intriguing instrument is the continuous temperature record at the upper left center of the board. It attracts attention because the stylographic pen is in almost constant motion—which it has to be, if one pen is to make a virtually complete record for each of nine temperature recording stations by moving back and forth as the paper unrolls and the pen adds the latest reading to each record in turn. It is, however, a frustratingly complicated performance to a visitor because the nine records are being kept on one large chart and the lines which indicate any particular temperature are different for each of the nine records. Each line, in other words, could theoretically indicate nine different temperatures, depending upon which of the records was crossing it. The engineer, familiar with the chart, has no such difficulty. He takes a quick look at it and says, "Just under 50 at Station 3 and well over 64 at Station 9, and the others are all in between. This is just as it should be on an average winter night."

Most of the temperature recording stations are now so hidden by the tropical vegetation that they are seldom noticed. There is one which is easy to see. Turn sharply to the left after passing the control panel and it is in view 25 feet ahead down the gravel pathway. It is located on a stout metal post a little higher than your head next to the right edge of the path. The actual thermometer is protected by a somewhat box-like structure at the top of the pole; an electric underground cable carries the information to the control panel.

Immediately above the temperature record is a dial which records the pressure under which the city water supply is entering the system. On the opposite side of the big central clock are alarms for dangerously high temperatures or pressures.

In the big steel cabinets at the right end of the control panel are switches for all the lights and electric outlets in the Climatron. This allows the Climatron to be illuminated effectively in the short days of mid-winter, or when it is open at night on special occasions. There are 110 incandescent lights of 1,000 watts each around the base of the dome. These are along the five "lunes," the vertical slices, (arched above the horizontal at the base) which connect the actual dome with the five supporting pylons. Other switches are suspended from the center of the dome. This dual system not only illuminates the Climatron effectively but it shows off the almost magical aspect of well-developed tropical vegetation far better than daylight. One looks up through layer after layer of different kinds of tropical foliage, much of it on long, gracefully-arching branches. Some of the layers catch the light, others are in shadow. One gets a vision of the beauty and diversity of tropical foliage in a way that is seldom or never possible in the actual tropics.

The controls and records for the giant fans which regulate air circulation for the building are in three horizontal lines at the very center of the control panel. For each of the fans there is a little window through which by bending close enough (and putting on one's glasses if need be) one can read the exact number of hours that particular fan has been operating since the recorder was set. Below this window are control switches and signals showing whether the fans are on or off and whether they are set to change automatically at certain temperatures or to be worked by hand. Twenty of these recording switches are for exhaust fans which pull the air through the building. In the lower right hand corner are control switches for air circulation, some for fresh air from outside, some to circulate heated air.

When the temperature of the outside air goes above 82° the air which is sucked in goes through a water curtain formed by 17 banks of nozzles.

Vegetation in the center of the Climatron as it looked at 15 months. There are now large trees in the background and less sunlight. The undergrowth is less crowded and looks essentially as it would in a second growth forest. The long pendant flowers of the CHENILLE PLANT *(Acalypha hispida)* can be seen in the upper center of the photograph (see discussion on page 18).

PHOTO, SHAW CAMERA SHOP

These were designed to be either spray or flood nozzles. In practice it has been found that due to the curvature of the building and the resulting air currents that the central twelve banks are the effective ones and that the spray nozzles are more practical than the flood nozzles. The inside edge of the water curtain apparatus can be seen on the opposite side of the Climatron from the entrance and on the lower level. Since it cools and moistens the air, the hotter the weather, the more refreshing is a stroll along the side of this cooling system. About all that one can readily see is a waffle-like series of small aluminum troughs reaching from the ground to the underside of the circuit walkway on the upper level. On the outer side of these batteries of trays, water is being shot up in a fine mist. Air, mingled with the mist, is drawn through the trays. Some of the water condenses in the troughs and is partially evaporated as it drips down from one trough to the next. These 17 banks of spray-nozzles can be turned on separately or, by using the upper left hand lever, all at once.

In the upper left hand corner of the Control Panel are the remainder of the switches and gauges for the air control system, chiefly the controls from the big metal dampers which open out more and more horizontally and allow the air to rush through when the fans are running. These monster fans require expert care; if you note, for instance, that the switch is off for one of the five, you may find when you go and visit that series that the engineer is installing a new fan belt.

The rear side of the Main Control Panel is no less important, though hidden from the public. Here there is a service area for the instruments on the panel. Here also is the loud speaker used when one of the staff or some particular visitor is needed in a hurry. This same system allows appropriate sound tapes to be played on special occasions as for instance the records of typical jungle noises brought back to St. Louis by Mr. Edgar Queeny.

Mr. Lad Cutak, the Greenhouse Superintendent, harvesting a pineapple which flowered and ripened in the Climatron. With increasing shade, a smaller and lesser known species of *Ananas* has provided a more reliable display.

PHOTO COURTESY OF THE ST. LOUIS POST-DISPATCH

HEATING

The two levels on which the Climatron is designed make it possible to conceal the heating equipment almost completely. None of the visitors who stand at the base of the waterfall ever suspect that the giant fan and heater are just a few feet away from them, ahead and slightly to the left. Air is taken in from many little vents in under the north end of the balcony walk by a large air-handling unit which forces it through steam coils whose wide fins radiate heat effectively. A 15 h.p. electric motor supplies the power for handling the air, and the heat comes from steam from the main boiler house. The warmed air continues through a tunnel in under the tropical jungle and is released just below the path level, at the south edge of the Climatron approximately opposite the point at which it was brought in.

The air temperature at the point of release varies with the demand. On a winter night if all is going well it will be 65° there. As it is pulled along from south to north towards the intake point it gives up heat. By the time it reaches the center of the Climatron it will be approximately 60 while temperatures at the north side of the greenhouse will be around 55. Two thermostat systems regulate these temperatures more or less automatically. A thermostat on the south side of the Climatron near the area where the heated air is released, controls air *temperature*. Another thermostat at the northern edge of the Climatron controls air *volume* at the inlet vanes of the air-handling unit. For instance if the temperature at the north side of the Climatron gets below 55° a larger volume of heated air is automatically forced through the building and the temperatures come up in the center and at the north side.

This same unit is used throughout the summer, for air circulation when the big exhaust fans are *not* in operation.

WINTER VENTILATION

The Climatron was designed to be ventilated during the winter by bringing in outside air through a fine spray of heated water, the colder the outside air, the hotter the water. In practice it was finally found that better results were obtained by carefully opening the ventilators in the peak of the dome during fine weather. By the original arrangement there was some winter damage from cold in the Climatron. Part of this was the direct effect of the cold on the plants. Tight overhead doors added to the intake dampers and plastic panels covering the exhaust dampers helped in maintaining better temperatures during zero weather.

The ALUMINUM PLANT *(Pilea cadierei)* has made an attractive pathside plant for several years and has gone through several cycles of flowering. (See p. 15.)

PHOTO, LAD CUTAK

The Climatron after 15 months as seen from the Gallery Walk. Only a very few plants in this picture (as for instance the Royal Palm to the right of the pillars) were of any size when they were set out. The vegetation around the waterfall is just beginning to assume the natural look it has maintained ever since. The return air duct (see pp. 11–12) shows at the lower left.

PHOTO, SHAW CAMERA SHOP

Ventilating through the dome controlled temperatures so much better that we not only saved on heating expenses; vegetation in the Climatron was not damaged by our emergency heaters. We had previously had to use smudge pots set out in the Climatron and burning a higher grade of fuel oil than when they are deliberately used for creating a protective blanket of smoke along with the heat, as in modern orange groves. While their fumes did not harm much of the vegetation in the Climatron, there are wide differences between various kinds of plants and some were quite sensitive.

During the winter there is so much condensation of moisture from the warm air when it comes against the cold dome that there is a persistent drip from the points where the triangular panes come together. Some visitors find this objectionable; others, particularly those who are homesick for tropical forests, accept it as adding to the realism of the Climatron. Between high fog, low clouds, and little showers, many tropical forests can be rather drippy places, even during the dry season.

Maintenance

A careful eye is kept on all equipment both night and day. By watching for any sign that a piece of complicated equipment is not working quite right most repairs and replacements are made in an orderly way and few break-downs develop into real emergencies. Even more than within an ordinary greenhouse constant watch is kept on the weather. Revised forecasts and special warnings, in addition to the regular forecasts, help us to be prepared for sudden changes in temperature.

If there is the slightest interruption of electrical power all electrical controls have to be reset by hand. Each month a complete check is made on lights, motor lubrication, filters, strainers, traps, pumps, and the general condition of all equipment. Nearly all maintenance is carried on by Garden personnel.

Maintenance costs are about $5,000 per year. This does not include money set aside for maintaining the building itself nor does it include anything for the salary of supervisory personnel. At present, oversight of the Climatron takes at least one third of the time of the Greenhouse Superintendent, and one quarter of the time of the Chief Engineer.

One essential feature of the original design was not carried out due to lack of funds. For the first five years we have operated without an electric generator for emergency use when there is an interruption in electric service. This meant that had there been a serious interruption in electrical service during the winter we stood a good change of losing all the plants in the Climatron. The peculiar construction of the Climatron makes it more vulnerable to frost damage during power failures in cold weather than are ordinary display greenhouses. At their most recent meeting the Trustees voted the funds for an emergency generator.

As we reach the end of the first five years, it is already apparent that we shall have various special problems of maintenance due to the Climatron's high humidity and to its unprecedented features. The sheet-metal inclosures of the big exhaust fans, for instance, would have given years of trouble-free service had they been in a dry attic. With the high humidity of the Climatron they are beginning to rust, particularly at the base, and will soon need attention. The big return air duct was made of sheet steel rather than aluminum alloy due to

Three fruits ripening on one of the PAPAYAS *(Carica papaya)* in the Climatron.

PHOTO, LAD CUTAK

The RED-HEADED POWDERPUFF, *Calliandra haematocephala.* This large-flowered relative of the mimosas has made a brilliant display for several years. It flowers nearly all winter and there are frequently a dozen or more flowers at any one time on our two large bushes. The puffs are brilliant red and the unopened buds, as large as your thumb, look very much like a very dark red raspberry and increase the interest of the flowering branches.

PHOTO, LAD CUTAK

lack of funds. In our high humidity it is rusting badly, particularly along its lower side. Holes to allow the water to escape would probably have lessened the difficulty. There have been other minor problems due to the humidity as for instance in the electrical conduits.

In the dome itself all predictions had to be qualified because of the new materials which were being tried out. The actual "skin" of the inner dome was made of triangular panes of Plexiglass set in gaskets of Neoprene (just as in jet-plane windows). For the last year it could be seen that the Neoprene is beginning to weathercrack and there is now more leakage in a heavy rain than when the structure was new. The Plexiglass panes themselves are beginning to bulge inwards. This has been particularly noticeable to those who have had occasion to work up towards the top of the dome where the panes are more nearly horizontal and the pull of gravity is directly inward.

BUILDING AND OPERATING COSTS

The cost of building the Climatron was approximately ¾ of a million dollars. The mechanical equipment alone cost $300,000. The concrete foundation came to $100,000. The balance was the cost of the dome. It is 70 feet high and 175 feet in diameter with a volume of 1,300,000 cubic feet and a ground surface of 23,000 square feet (a little over half an acre).

With the changes that have been made in the heating and air circulation systems, the Climatron now costs approximately $6,000 per year for fuel oil in addition to the charges for water and electricity.

Two men work full time, caring for the plantings and the walks, picking up dead leaves, pruning back vegetation, keeping the pool attractive, taking out old plants and setting in new ones. Their combined salaries are slightly over $8,500 per year. Keeping attendants at the entrance turnstiles costs approximately $5,500 per year if we include week-ends and holidays.

THE WATERFALL

The waterfall is made to seem even higher than it is by having the water bubble up from an artificial spring at the rate of approximately 250 gallons per minute and come rushing down a steep, winding, rock-lined slope to the brink of the falls. Designing the rocks so that it splashes over them effectively not only adds to the visitor's illusion of being on a tropical mountainside but helps the plants in the immediate vicinity by cooling and humidifying the air.

By means of a four inch centrifugal pump (powered with a 1½ horsepower continuous duty electric motor) the water is returned to the spring and used over and over. A leveling tank, in back of the waterfall, keeps the water in the pool at the desired height.

Observant visitors sometimes wonder if there is something wrong with their eyes when they notice that one of the stones is slowly moving around the pool. It is a piece of genuine pumice, foamy lava which cooled quickly and has so much air trapped in it that it is lighter than water. Similar rocks, finely powdered, have long been widely used as scouring agents.

To most visitors one of the most fascinating features of the Climatron is the tropical pool, either seen from above along the gallery walk or from beneath the water by means of a plastic-covered tunnel. The pool and tunnel were not installed when the building was opened and this was made possible by generous gifts from the Federated Garden Clubs and the Horticultural Council. The pool features tropical water lilies and a few other plants as well as several kinds of tropical fish. At its shallow end it has a magnificent clump of Papyrus, the giant sedge whose shoulder high stalks terminate in skyrocket bursts of wiry green branches. It was the pith from such stems, sliced, pounded and glued together which made the famous papyri of which the ancient

Egyptians made their picture-writing libraries. Near it is a Mangrove plant which has been growing actively ever since it got one of its creeping root stocks out of the pot in which it was growing and firmly anchored in the bottom of the pool.

The maintenance of the pool and the tunnel have been our worst headache in operating the Climatron. In trying to keep the fish healthy, the water lilies in flower, and the plastic cover of the tunnel free of an algal scum one is constantly working at cross purposes. Chemicals which could eliminate the algae, would kill the fish, and so on. By recirculating and filtering the water at very short intervals, by regulating its temperature and height, and by working out methods for scrubbing off the algae without seriously scratching the plastic, we now manage to keep it reasonably attractive most of the time. In addition to natural lighting, the pool is illuminated by eight 500 watt underwater flood lights. The fish are nearly constantly on display, particularly the "kissing" fish whose sensuous lips wipe off the algae on which they feed, whether this green scum be growing on water plants or on the very plastic itself. Of the water plants, the tropical water-lilies make the most effective display seen from beneath. Their many leafstalks arch upwards to the surface and their floating leaves so affect the surface tension of the water all around their edges as to catch the light in beautiful patterns.

The tunnel has added an unexpected interest to the pool as viewed from above. The curved surface distorts the shapes of people going through the tunnel so that they look flat and almost two dimensional while their movements seem to be an undulating glide. Part of the time the view of the tunnel is partly veiled by the water lily leaves and visitors catch only glimpses of the tunnel here and there between the leaves. As they look down at the lilies and the fish, if they catch a glimpse of human beings in the tunnel, more often than not, they think at first it is some strange water animal, probably a fish but certainly a large and peculiar one. Usually they figure the truth out for themselves but those who visit the Climatron frequently, remember with amusement such incidents as the argument between two old ladies, one of whom was positive she was looking at a strange fish and one who was just as certain that it was a small boy in an orange sport shirt!

The water in the pool flows by gravity to the filter bed whose overall thickness is over two feet; 16 inches of sand, 6 inches of gravel with diameters of two to three-eighths of an inch, and 4 inches of coarser gravel with diameters of four to seven-eighths. The water is then picked up by a centrifugal pump and returned to the pool at intervals. This system filters water at the rate of 1200 gallons per hour which is approximately 29,000 gallons each 24 hours so that it takes about a day and a half to filter the approximately 37,000 gallons in the pool.

STRAIGHT ahead from the entrance, along the slightly curving path which leads to the graceful pillars of the old Palm House (which stood on this site for nearly half a century) are a number of plants of general interest in one way or another. Immediately to the right (and usually lending its shade to an exhibit of Cattleya orchids brought in from one of the growing houses) is a large clump of a Mexican species of Heliconia. This genus of plants in the Banana family, takes the place in the New world of the closely related Bird of Paradise flowers which are native to Africa. Like them the actual flowers are borne in a curious, more or less canoe-shaped bract. These Heliconias usually flower during the summer but the brilliant bracts hold their color while the flowers are going to seed. All the Heliconias we have tried out in the Climatron have done well and we have some kinds which are new to cultivation as well as some of the commoner sorts.

The rampantly growing tree at the junction of the two paths to the left is the Banyan Tree, *Ficus bengalensis*, one of the Sacred Trees of India. Prop roots are being actively sent down from the upper branches and if we had let them take root and had not pruned the branches drastically several times, this one specimen would already have monopolized the whole sunny area where the major paths come together. In India fine old specimens of this tree may cover several acres and in many ways are more like an openwork temple supported by many columns than they are like a tree.

Immediately next to the walk, at the left, is an ALUMINUM PLANT, (p. 9), *Pilea cadierei*, a native of Viet Nam introduced into the United States as a houseplant in modern times. For several years it has remained in attractive

The CERIMAN, *Monstera deliciosa*, in full flower. Young, rapidly-growing specimens of this plant with many conspicuous holes in their leaves are sometimes sold as the "Swiss-cheese-plant" and were once classified as *Philodendron pertusum*. This tropical relative of the Jack-in-the-Pulpit comes from Mexico. Each of the little circles (which can just barely be seen in the central part of the picture) is the tip of a single flower; several hundred of them make up this club-shaped inflorescence. It ripens into a sweet, watery fruit with a flavor much like ripe pineapples with a strong banana fragrance. Many of the Philodendrons in the Climatron flower, usually in the springtime. Their flowers are much like this but even fleshier and with the outer spathe opening less widely. Most of them are white or yellowish; one is a beautiful dark red.

PHOTO, LAD CUTAK

The Waterfall, October 1960.

The Waterfall, one year later.

The Waterfall, two years later. The small tree-ferns at the left and the young ORCHID-TREE *(Bauhinia)* at the lower right of this final picture are now thrifty young trees nearly as high as the bananas.

ALL THESE PHOTOS BY SHAW CAMERA SHOP

condition almost constantly throughout the year. Its neat little leaves with a regular pattern of silver and green are more beautiful than the curious little flower spikes it bears from time to time.

At the right side of the walk are a few bright-leaved CROTONS *(Codiaeum variegatum)* more brilliant than most flowers. These ornamental shrubs have been cultivated for centuries, no one knows for how long, on many islands of the Pacific and some of our commonest varieties were brought back years ago in the days of the sailing ships. They have long been a standby in tropical and sub-tropical gardening but in the last few decades many attractive new varieties have been put on the market and they have become popular in southern Florida and as high grade house plants in the North.

Immediately behind them are young specimens of two kinds of rubber. The kinds of plants which produce the non-synthetic commercial rubbers belong to various unrelated trees, vines, and herbaceous plants, among which the RUBBER PLANT of Victorian drawing rooms, *Ficus elastica*, is relatively unimportant. The other two shown here are the MEXICAN RUBBER TREE, *Castilla elastica*, and PARA RUBBER, *Hevea brasiliensis*, commercially by far the most important of the natural rubbers.

If we look up the slope at the right the long bright pink blossoms of the

CHENILLE-PLANT, *Acalypha hispida*, are sure to catch our eye, for this remarkable bush has been in full bloom every day since the Climatron was opened. No wonder it is a stand-by in so many tropical and sub-tropical gardens (there are long hedges of them on some atolls). One of our former graduate students, Dr. Howard Pfeiffer, studying it in the Climatron, worked out part of the story as to why it blooms so constantly. The velvety wands are largely made up of styles (receptive organs) of female flowers, packed closely together. There they hang, unfulfilled, month after month and year after year. Not only are there no known male bushes anywhere in this country, there are apparently no specimens of them in the world's herbaria and no published record of them anywhere, though possibly they may exist as wild plants, somewhere in Asia. A popular guide to Hawaiian Flowers once claimed that all the Hawaiian specimens were males but investigation showed that the booklet had just turned the facts around accidentally; there as elsewhere the bushes are all females.

On the same slope are several specimens of the SILK OAK, *Grevillea robusta*, an Australian tree widely used throughout the tropics as an ornamental tree or for shading coffee plantations. It is, for instance, one of the commonest trees one sees in driving along the roads near Antigua, Guatemala. Its gray fern-like leaves are so handsome that they are shipped in from the sub-tropics to use for decorating. Potted or tubbed specimens a few feet high are grown on sun porches and in small greenhouses. It has been interesting to watch these graceful trees shoot up just as rapidly as they do in the tropics during the first years of the Climatron. They have not yet flowered though they have now reached about that size and we hope they may since they are members of the Proteaceae, typical of Australia and South Africa, whose charming sprays of bloom are so unlike those of other plants that they look as if they had been designed by interior decorators.

Still farther up the slope is a strange and graceful tree which is seldom seen in cultivation, *Ficus pseudopalma*, the PALM-LEAVED FIG. It is a fig which does not look remotely like a fig. Its slender stem, about the size of a boy's wrist, carries way up into the air its terminal crown of tightly bunched big leaves. There is another specimen of this species farther along the ridge and one is most apt to see them, looking off across the Climatron from some vantage point rather than close at hand. The crown of leaves floats up above the massed vegetation of the other trees with a kind of serenity.

Just a little farther along the walk is a rapidly growing specimen, cut back from time to time, of another species of *Ficus*. It is the SACRED BO TREE, *F. religiosa*, under which Buddha sat when he received his enlightenment. Its beautiful gray-green leaves are roughly the size and shape of a human hand with the fingers extended but pressed close to each other. The apex of the leaf can be prolonged into a narrow "drip point" which in extreme specimens is a kind of little tail as long as the leaf itself. Such points are found frequently enough on rain forest trees that some botanists have supposed they were an actual adaptation to a rainy habitat. The leaves are so thin and tough that when pressed they are like a piece of fine canvas. In the Orient they are sometimes used for painting holy pictures. These vary all the way from elegant scenes almost like a Persian miniature, to slap-dash images of Buddha horne up by a sacred lotus flower, but in either extreme the picture and gilt decoration cover the entire upper surface of the leaf, drip point and all.

In Ceylon and other tropical countries to which the BO TREE was long ago carried by Buddhists, it is sacred because Buddha sat under it, but in parts of India it is a survival from a much more ancient nature worship. There it would be more accurate to say that Buddha sat under it because it *was* sacred and therefore made an appropriate shade in which to meditate.

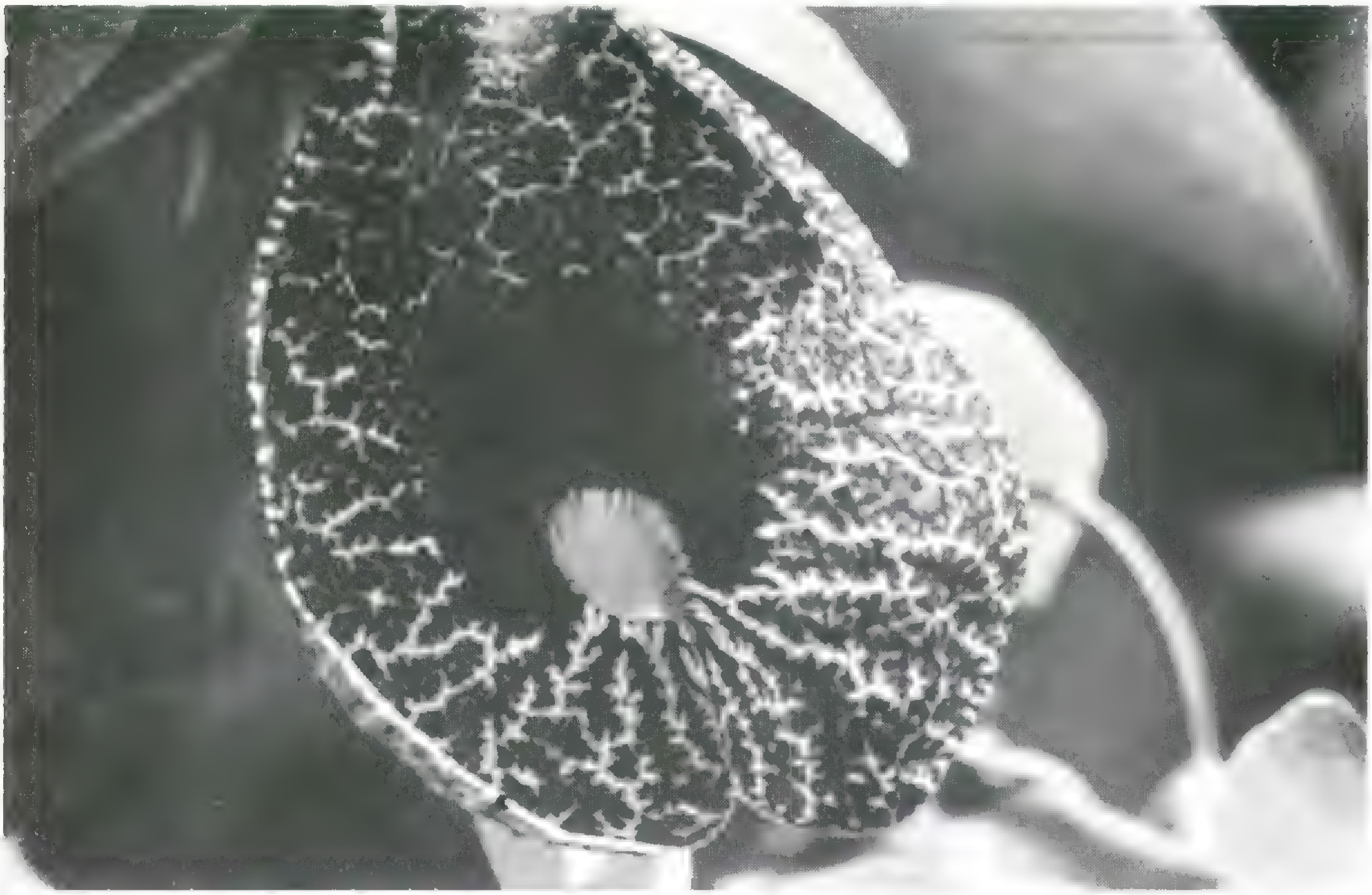
On the opposite side of the path is one end of a long narrow bog which one would touch at two other points if he kept steadily to the left along this circular path until he returned to the entrance. Floating on the surface of the bog are the attractive rosettes of the WATER-LETTUCE, *Pistia stratiotes,* a native of the Caribbean tropics that is now common in many warm parts of the world. Its crisply erect, velvety leaves conceal the little bunch of roots which hang down into the water. The tiny green flowers are even more completely hidden at the base of the leaves. They demonstrate that, though one would never have suspected the fact, Pistia is closely related to such plants as JACK-IN-THE-PULPIT and PHILODENDRON. Though the WATER-LETTUCE is nearly always attractive on the bog, it varies somewhat with the season. Seen at its best, when large plants, each one a perfect rosette, cover almost all the water surface of the bog, it is really spectacular. From time to time it is also on display in the fountain and pool at the edge of the lower level of the Climatron.

For the world as a whole, one of the most important families of plants is the true palms. Because botany as a science has been largely based in the temperate zone, there are still relatively few botanists who know very many palms or have any understanding of their evolutionary and ecological roles or their continuing importance in modern technology (some of them yield over a ton a year). The Climatron is a good place to extend one's acquaintance with these plants so that they will no longer be just a blur in one's memory. Just ahead on the left and before we come to the water fountain is a palm whose trunks are only a little taller than a man, so that the whole plant is convenient to study.

It is *Actinophloeus macarthuri* of New Guinea, appropriately known as the CLUSTER-PALM. Its slender trunks spread from underground rootstocks and the little plant with three or four stems we got from Florida just before the Climatron was opened, now has 9 trunks in all and it has been flowering and occasionally fruiting for several years. Most of the inflorescences on this specimen have been male and there is nearly always at least one to be seen in some stage of its development. Each springs directly out of the trunk, though a scar shows that there was once a leaf just below the point where it developed. It is slender, about the size of a broomstraw, though chunkier, looking as if it had been carved out of dark green wax. It has a few branches along which the globular green buds are borne one at a time and well spaced from each other. After remaining unopened for many weeks, they suddenly break into bloom. Each flower develops into little more than 6 tiny succulent stamens and the whole blossom is an austere tassel of green and light yellow. Though most of the inflorescences have been male, enough have been female so that there have been crops of the little nuts which have sowed themselves at the base of the tree, producing many seedlings which were given away or hoed up.

Just a little ahead and to the right (behind the drinking fountain) is a palm so distinctive that many of our visitors do not recognize it as a palm at all. It is one of the FISHTAIL PALMS, *Caryota.* Its big leaves are divided, and these parts redivided, the ultimate portions being more or less triangular and about the size of a human hand. It gives the whole leaf somewhat the appearance of a gigantic Maidenhair fern.

By passing on to the pillars of the old palm house we can look down on the lower level where two fine specimens of the ROYAL PALM, *Roystonea regia,* are directly in front of us. They are among those palms whose trunks



Flower of CALICO FLOWER *(Aristolochia elegans)* about half natural size (p. 26).

PHOTO, LAD CUTAK

are extended by a "crownshaft," an extension of the trunk formed by overlapping leafstalks. In the ROYAL PALM the crownshaft is so elegantly formed that it almost looks as if the leaves were held in a large green vase fitted to the summit of the smooth Gray-brown trunk (see figure, p. 10).

These two trees were trucked up from Florida just before the Climatron was opened and by studying the rings around the trunk (formed as the leaves fall off) one can see the place where the widely spaced leaves of the Florida nursery were followed by leaves very close together, just after the palm was transplanted, and then farther apart as it began to take hold in the new site. For several years it has flowered each summer. It has both male and female flowers but in separate panicles which come out of the trunk just below the base of the crownshaft. The dried up remains of last year's panicles are frequently left on the tree, where they look something like dried up little Christmas trees about two feet long, the female ones bearing small round nuts.

The flowering panicles are borne in a specialized sheath which covers them completely and has the appearance of an elegant green-leather case, possibly something designed for some strange oriental musical instrument. When the male panicles first open they form chaste plumes of white until they begin to shed more and more pollen. Then for some weeks it looks is if a five or ten pound bag of fine white meal had been emptied up in the tree, coating everything just beneath it.

Other palms will be found here and there throughout the Climatron, a COCONUT PALM, *Cocos nucifera,* in vigorous young growth near the entrance to the tunnel under the Pool, demonstrating how much at home even this palm, which does not do well in most greenhouses, has made itself in the Climatron.

Speaking of palms, the Climatron has a number of plants which are not palms though sometimes that word is part of their common name. The PANAMA-HAT PALM, *Carludovica palmata,* is a good example. There is a fine clump of it on the curving path around the bog. Its leaves look something like a sloppily-formed fan-palm but the leaf stalk blends gradually with the expanded blade without ever showing any sharp line of division as in the true plams. The leaves of this plant, about as high as a man when well developed, are widely grown in the American tropics and were once the basis for a thriving business in high quality hot-weather hats all over the world. Many hats are still produced for local customers and the best of these are beautifully woven and almost indestructible. *Carludovica* is usually classified in a little family of plants, the Cyclanthaceae "with leaves like palms and flowers like aroids." Many botanists have heard of these curious blossoms but never seen them. When the specimen in the Climatron flowered in 1964, the blossoms proved to be even more peculiar than the diagrammatic pictures of them in botany books. They looked like a green club on a stalk formed with squarish male and female flowers set closely together in a complicated but regular pattern.

SHELL GINGER, *Alpinia speciosa.* Since the very first winter this porcelain-white flower ornamented with red and yellow has been a standby for much of the time. At times it has had to be cut back severely when the bushy clumps of it were too oppressive to its neighbors.
PHOTO, LAD CUTAK

It did not look like a real blossom; it was much more like one of the old German enlarged models designed to make the structure of complicated little flowers more comprehensible to advanced students of botany.

Another plant in the Climatron which has frequently been mistaken for a seedling palm is the appropriately named PALM-GRASS *(Setaria palmifolia)*. Until it sends up its drooping tassel of green flowers it looks more like a small palm than a large grass. The long narrow leaf blades taper to either end, and can be up to two feet long and three inches wide. In their general shape they remind one of the seedling leaves of some palms. They have an elegant texture, being minutely folded back and forth like a fan. This ribbing is so fine and so regular that at their best they look as if they had been nicely made out of some fabric.

In a well established but not yet overgrown clump, a dozen or so of the leaves will arch out gracefully away from the center of the plant. As they come into tassel the stems shoot up higher and may reach six feet. When they begin to go to seed they look less attractive and need to be ruthlessly cut back or taken out altogether.

Palm-Grass will take a good deal of shade and still flourish; it seems to be one of those things which belong around the edge of a tropical forest or along pathways through it. The Garden's original stock came to us some years ago from Los Angeles. It was sent by one of our former graduate students, Dr. Mildred Mathias, who obtained it from a choice amateur collection of tropical plants. On a recent visit to the Garden she remarked that it has now become increasingly common in the Los Angeles area and in some gardens is almost a weed, though still fundamentally an attractive plant.

To a botanist *Setaria palmifolia* is particularly interesting in the Climatron because we see it there in the kind of place we don't expect grass—side-by-side with plants from wet tropical forests. Generally speaking, in the Tropics we get forests where it is wet and hot, grasslands where the country is drier or where it gets burned over regularly. Over most tropical landscapes, grasses and trees are rivals; we mostly get one or the other. In the Climatron, Palm-Grass has been worth trying because it will take a good deal of shade and still flourish. At its best when the clumps are young, it has been able to keep a good appearance even when growing at the edge of walks used by thousands of visitors. The seed stalks are not only somewhat unsightly, they shed seeds which can ride away on a trouser cuff and the first thing one knows another plant of Palm-Grass is growing way over in another part of the Climatron. So far Mr. Cutak has been able to control it by grubbing out over-sized plants but we may sometime have to get rid of it completely.

The Gallery Walk which carries the upper level a full half circle around the rear of the Climatron, has gradually developed into one of the most attractive features of the building. A visitor gets an overall view of lush tropical vegetation and its bewildering variety, he can look down into a banana in flower and study the details of the ripening fruit clusters, he can view the flowering branches of the royal palms at eye level instead of trying to see them through other vegetation, and it provides a practical trellis for several attractive tropical climbers.

PASSION-FLOWERS. Along the gallery are several different species of Passiflora most of which flower at some time each year. While they differ in many ways all are vines with attractively coiled tendrils. The flowers are different enough from those of other plants to interest anyone who has ever looked carefully at a flower of any sort, be he a professional botanist, an artist, a gardener or an amateur naturalist. They are dominated by a fleshy outgrowth, technically a 'corona," which may be variously cut and divided. Its most conspicuous portion, in those which flower in the Climatron, is a radiating glory of long graceful rays which may be variously curved, colored and patterned, depending upon the species and the variety. These rays emerge above the petals and sepals and may extend beyond them. A further air of complexity is due to the remainder of the flower parts (the stamens and the pistil) being carried on a special stalk which rises up out of the center of the blossom.

In the early days of Spanish and Portuguese explorations in South Amerca these blooms were interpreted as symbols of Christ's suffering on His way to the Cross (His "passion"). The woodcuts which illustrated the earliest accounts of passion-flower were usually made by men who had not seen the blossoms themselves and they became as fabulous as the unicorn.

All the passion-flowers are fragrant, frequently with a musky undertone. Many of them have edible fruits, the best of which are now widespread in tropical and sub-tropical countries.

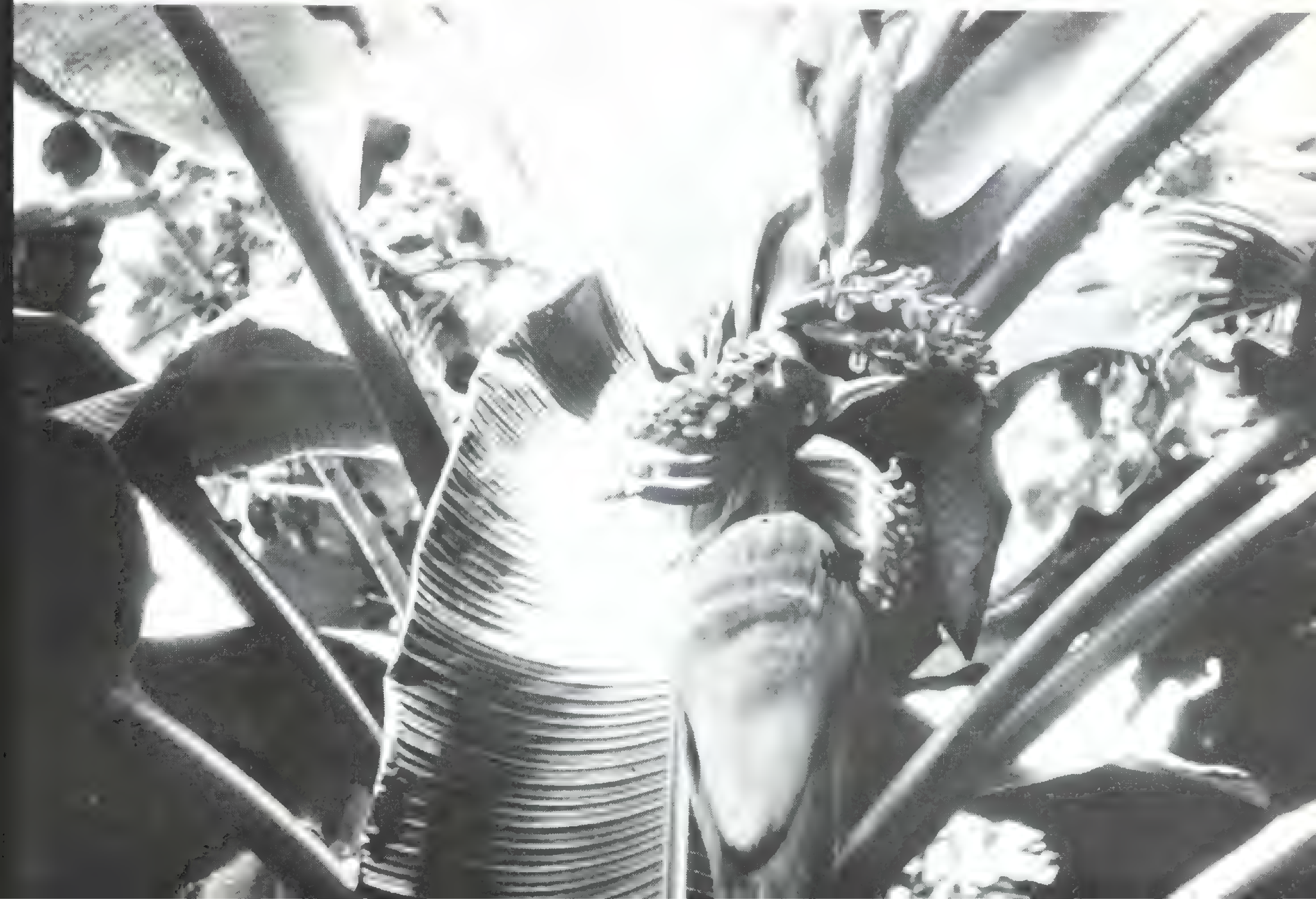
Stigmaphyllon ciliatum, GOLDEN *VINE*. This handsome climber from Brazil is now flowering more profusely each year along the gallery and we are hoping that it may become a permanent attraction in late winter and early spring. The separate flowers are much the size, shape, color, and texture of the familiar "Dancing Girl" orchids and are borne in small clusters which on a healthy vine aggregate into golden masses which remain attractive for weeks.

Our particular plant has an interesting history which serves to illustrate the superiority of the Climatron over ordinary greenhouses for many tropical plants. When our Greenhouse Superintendent, Mr. Lad. Cutak, was a young man he once entered a national photographic competition and carried off several top prizes. One of them was this flowering vine which he set out in his home garden each summer and treated like a house plant in the winter time. Eventually he brought it up to the Botanical Garden and kept it in one of the greenhouses though it never amounted to very much. After the Climatron was opened it was planted there and grew up to the Gallery where it now serves each year as a sort of living Gold Medal.

Congea tomentosa (which seems to have no common name in English) is another tropical climber which is doing better each year in the Climatron. A somewhat shrubby vine, it bursts through the rampant foliage of the passion-flowers and catches the attention of passersby. Its tiny flowers grow in small clusters, each set off by three velvety bracts over an inch long, so regularly spaced that they give the whole cluster the appearance of a single blossom. As the flowers open, the bracts gradually develop a pinkish lavender tinge, a color characteristic of the Verbena family to which Congea belongs. These dainty, three-sided nosegays are borne in loose sprays. The tiny hairs with which they are covered catch the light so that at times they shine in the distance. If arranged as a bouquet they dry perfectly without withering at all. The ladies who arrange the flowers at TOWER GROVE, Mr. Shaw's old country residence, are hoping that next year Congea may bear heavily enough to supply flowers in quantity.

Tetrastigma voinierianum, TROPICAL GRAPE. This spectacular vine is almost too much at home in the Climatron. Its thick, slightly succulent leaves look very much like Virginia Creeper foliage which had been miraculously enlarged until the leaves became two feet or more across. In the Climatron it grows even more rapidly than does a Virginia Creeper in a humid Missouri woodland; it has to be cut back vigorously and repeatedly. Yet the big firm leaves stay attractive throughout the year and are seldom injured, even when the Climatron is crowded. Though native to South America this particular tropical grape first became known to science when it was collected from a vine growing over the first Roman Catholic Cathedral in Tonkin, Indo-China. It has been planted a good deal in patios in the Los Angeles area and in gardens in southern Florida.

A banana photographed from the Gallery Walk. It is in the early stages of flowering. The hundreds of flowers yet to come, covered by their overlapping bracts, hang straight down in the lower center of the picture, forming an object which looks something like a lizard's head. Three bracts with associated female flowers have already opened. Going up the stalk from the bud there is a cluster at the right, the light-colored flowers contrasting with the dark bract behind them, then a cluster to the left whose dark bract is already withering up. Behind the curving tip of this bract one can make out the almost pure white stem (with a shadow across it) which leads straight down into the clusters of flowers. Upward it curves backward and to the left to the point where it recently pushed out from between the clustering leaf bases. This remarkable picture, taken at the moment when growth is rapid and there are changes from hour to hour, was taken by Lad Cutak. (See pp. 26–27.)



"The big BIRD-OF-PARADISE" *(Strelitzia nicolai)* with flowers of blue and milk-white. See pp. 27–28.

PHOTO, LAD CUTAK

Aristolochia elegans, the CALICO-FLOWER. This handsome tropical relative of the "Dutchman's Pipe" vines, so frequently planted to screen American porches in the gay nineties, does well in the Climatron and stays in bloom for long periods. The flowers last only a short time but are borne very freely. The conspicuous part of the flower is roughly heart-shaped, a velvety chocolate purple within, merging into white, veined with red purple. This vine is pollinated by flies which are lured into a complicated series of chambers at the base of the flower and are trapped there until the plant eventually releases them (see p. 20).

BANANAS (various species of *Musa*) and their relatives. From the Gallery one can see several kinds of bananas, growing just as they do in the tropics and flowering and ripening their fruits. Though we call them banana trees they are really not trees, just enormous perennials whose stalks die down when they finish fruiting while new stalks for the next season sprout up rapidly from the roots. There is no really woody tissue in the stalks; they can be cut off neatly by a single stroke of a well-aimed *machete*. The pithy stem is surrounded by the overlapping bases of the big leaves. These overlap so tightly that even though one cuts the stalk into short lengths, it takes persistence and strong fingers to pull them apart from each other. When they finally are removed they are completely separate, not being stuck together in any way except by mutual pressure.

When a banana plant blooms, the

stem grows out from the cluster of leaves around it and is so weak that it hangs straight down as the flowers and fruit develop. The joints of the flowering portion get closer and closer together. There is a colored leaf (technically a "bract") at each joint and, nestled at its base as one can see when it opens out, is a whole row of chunky, finger-shaped flowers. Domesticated bananas do not require pollination to set their fruit (the seeds never develop any more than as little black specks) but they go through the same sequences of bloom as do the wild (and horribly seedy) ones. The first few joints have only female flowers and these grow rapidly into little "hands" of green fingers at each joint. After a foot or more of these 'hands" then there is nothing but small male flowers, joint after joint. In many kinds of bananas this flowering keeps on though less and less vigorously even when the fruits begin to ripen. The male flowers dry and drop off shortly after they have come into bloom. For many weeks the developing bunch of bananas has a strange appearance: first the ripening fruit, then a long tail of bare joints where the clusters of male flowers have all fallen off, and finally at the very tip, a cluster of all the remaining male flowers, tightly wrapped in their dark-colored bracts, a top-shaped object several inches long, pointed dramatically downward.

The Gallery Walk is a good place to enlarge one's understanding not only of bananas but of the whole Musaceae, the family to which the banana belongs. They all have rather similar leaves with a long midvein and many straight parallel sideveins joining it at right angles and extending all the way to the margin. There are several species of Heliconia in the plantings of the lower level of the Climatron and during a good part of the year their bright flower clusters, like long yellow or orange birdbeaks, can be seen rising above the foliage.

All the Heliconias are native to the New World; their closest relatives are the BIRD-OF-PARADISE FLOWERS of Africa. The common species with orange and blue flowers has been grown in gardens in the warmer parts of this country for many years and more recently its blossoms have been flown in to our cut-flower market and potted plants in bloom have been sold to the luxury trade. Their scientific names are barbarous mixtures of German, Russian, and Latin but they become quite interesting when you know the story behind them. Sir Joseph Banks named the first one when he was doing everything he could to interest the royal family in making their garden at Kew as botanical as possible. (Successive generations of botanical directors eventually wangled the entire property away from the Crown but visitors are still shown the old Palace.) Accordingly he dedicated the new genus, as well as the species itself, to the wife of George III. In her own right she was Charlotte Sophia von Mecklinburg-Strelitz. He flattered her growing interest in a better garden by concocting for this beautiful plant the scientific name, *Strelitzia reginae*. When a century later, the largest of all the *Strelitzia*'s came into the hands of two German-Russian botanists they kept up the tradition and named it S. *nicolai* in honor of the Grand Duke Nicolai Nicolajewitsch. Certainly no other small genus can boast of such an aristocratic air!

Strelitzia nicolai had developed enormously since it was moved in next to the deep end of the pool and adjacent to the Gallery. It is in flower virtually all the time and makes this a convenient spot in which to study blooms of the BIRD-OF-PARADISE FLOWERS. The dark purple boatlike spathe at the bottom of each cluster bears a great number of flowers and they pop up one or two at a time. The conspicuous sepals are a milky white and the two largest petals are light blue. They are stuck together into a pointed tongue with a long groove down the middle of which lie the stamens and the style (see p. 26).

Tropical species and hybrids of Hibiscus (sometimes called "Rose-of-China") are always in flower near this point, in masses during the summer when many of the varieties flower the best. Their bowl-shaped flowers can be over six inches across and may be single or double, red, white, pink, or orange. The variety SAN DIEGO RED, has the best record of all and has been in continuous (and usually spectacular) bloom for over four years.

* * *

HELP!

VOLUNTEERS NEEDED

1. To sell in the Gift Shop
   Please contact Mrs. Maritz
   TO 5-0440

2. General Gardening
   Please contact Miss Carr
   TO 5-0440

3. Guides for groups visiting the Garden, schools, organizations, conventions.
   Please contact Mrs. Guth
   TO 5-0440

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

September 1965
Volume LIII
Number 7

VOLUNTEERS

Several responses to the call for volunteer help in the June BULLETIN have resulted in hours of fruitful service to the Garden. If you have extra time which the Garden might use, call Sally Carr at TO 5-0440, Monday through Friday.

* * *

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879

Missouri Botanical Garden Bulletin

Vol, LIII No. 7 September 1965

THE NEW GARDEN GATE SHOP

A Preview for Friends of the Garden, September 30th

The southern flank of the Main Gate is being completely transformed and will open, with a Preview for Friends of the Garden, on September 30th as the Garden Gate Shop. Basic structural changes were made in the late spring, doubling its size and letting in more light, making it more comfortable for visitors (and for those who serve there) with improved heating, insulation, and air-conditioning. During the month of September, while being restocked, redesigned and redecorated, it will be closed to the public for about a fortnight.

The Preview will overlap with the Outdoor Sculpture Show to be staged at the Garden by the Bi-Centennial Committee. This show will be in the area immediately around the new water-lily pools which should then be still very lovely. On the evening of the 30th there will be a German Music Festival with a band and refreshments.

The whole affair will be *strictly limited to the Friends of the Garden,* except that each Friend is being encouraged to bring as a guest, a potential *new* friend of the Garden. All members will be mailed invitations giving complete details, well before the event. With the band music, the Climatron's golden dome reflected in the pools, and Dr. David Gates, the Garden's new Director, it will be a gala occasion.

The Garden Gate might well have been named "The Four Season's Shop" for it will cater to the needs and interests of gardeners throughout the whole twelve months, It will, among other things, have on sale:

Garden tools
Flower arranging aids
Garden and patio ornaments
Post cards
Garden books and pamphlets
Floral prints
Bird-houses and feeders
Tan-bark and garden soil (small bags for house-plants)
Colored lantern-slides of the Garden
Christmas decorations (including wreaths of dried materials)

Cover: The new Water-Lily Pools and Main Gate seen from in front of the Climatron. This is the area in which an outdoor sculpture show will be held early this fall. The west windows of the new Garden Gate Shop can be seen in the shade of the Pyramidal Gingko at the right of the Gate.

PHOTO, COURTESY SHAW CAMERA SHOP

The twin doors and windows of the new Garden Gate Shop as they look shortly before sunset.
PHOTO, COURTESY SHAW CAMERA SHOP

BOOK REVIEW

Deadly Harvest: A Guide to Common Poisonous Plants. John M. Kingsbury, pp. 128. Holt, Rinehart and Winston, 1965. $4.50.

THIS little book was written by a man who knows what he is talking about. His authoritative *Poisonous Plants of the United States and Canada,** written as a textbook for his students of Veterinary Medicine, is a 627 page digest of the world's published evidence (he refers to 1,715 books and scientific papers) on poisonous American plants and their poisons.

Deadly Harvest is quite another kind of book, written for the general reader. It discusses how much the experts have yet to learn, and digests the facts that should be known to all intelligent citizens. The author tells us that he has "included all those plants that, on the present record, seem most likely to get human beings into trouble." For around a hundred of these he gives descriptive comments in language as non-technical as possible and provides effective drawings in black and white to illustrate his remarks. The poisons are discussed as well as the plants. He describes when and where they occur in the plants, some bare fundamentals of their chemistry, the various ways they affect man and his livestock, and a little about antidotes.

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* *Poisonous Plants of the United States and Canada.* Prentice-Hall, Englewood Cliffs, New Jersey. 1964.

Among common plants (or plant parts) which can be dangerously poisonous, Kingsbury lists the following:

daffodil bulbs
potato sprouts
rhubarb leaf-blades
peach, cherry, and apple seeds
oleander flowers, leaves, and stems (the latter have caused illness when used as roasting sticks for "hot dogs")
poinsettia leaves
yew seeds and foliage
seeds of castor-oil-beans
bulbs of star of Bethlehem
rosary-peas

The last item on this list is also known as "crabs' eyes" or "rosary-bean." These are the brilliant seeds of a tropical vine *(Abrus precatorious)*, widely grown in the tropics since ancient times. They are half the size of a cultivated pea and much more oval. They are bright scarlet, shiny black at one end and make handsome rosaries, necklaces, and earrings. Though their importation is now officially outlawed, they are being brought back to this country increasingly by tourists as souvenirs. They contain one of the world's most violent poisons but fortunately need to be pulverized for its maximum effect.

Jack-in-the-pulpit and many related houseplants, Mother-in-law's tongue, Calladium, some Philodendrons, contain tiny oxalic acid crystals which are so sharp and so plentiful that chewing them (oxalic acid is itself a serious poison) causes painful swelling of the tongue and mouth parts. Kingsbury warns us that we should take these possibilities seriously. "Dumbcane gets its common name from the fact that intense irritation of the mouth and throat usually prevents a person from talking for a while. Some think practical jokes with these plants are funny, but the truth is that more than one person has lost his life when tissues about the back of the tongue swelled up and blocked breathing as a result of taking a mouthful."

EDGAR ANDERSON

A SUMMER'S AFTERNOON WITH HENRY SHAW AND HIS FRIENDS

WILBUR M. SHANKLAND

INTRODUCTION: As the years go on, the various monuments and inscriptions provided for his Botanical Garden by Henry Shaw become of increasing interest. A marble slab near a group of Yuccas, and dedicated to Dr. Charles A. Pope, is now almost illegible and intrigues many visitors. Older members of the staff can only tell them that the stone once marked a sprawling old plant of a Colorado species of Yucca which was eventually so badly injured by a mowing machine that it had to be removed. The special significance of this particular plant and the ceremonies connected with the placing of the stone had been completely forgotten until the St. Louis Medical historian, Dr. Wilbur M. Shankland, uncovered the evidence in his researches into the history of Dr. Pope and his medical and scientific interests.

Dr. Shankland has graciously shared his discoveries with us and has permitted us to publish portions of his monographs which illuminate the history of Henry Shaw's Missouri Botanical Garden. Elsewhere in this issue we are publishing a short note describing the role of the Yucca collection in the scientific development of the Garden. In later numbers of the BULLETIN we hope to publish other fascinating bits of St. Louis history unearthed by Dr. Shankland. E.A.

FIRST, let us reproduce the account of the subject event as it appeared in an issue of the old *Missouri Republican* of June 11, 1883, written by one of St. Louis' foremost journalists of the nineteenth century.[1] The article shows that those who answered Mr. Shaw's invitation were not only giving deference to the honoree of the occasion, Dr. Charles A. Pope, but implied a like tribute to the good works of their famous host as these were related to all aspects of the contemporary community. Men who were leaders in the professional, scientific and commercial life of St. Louis were there and for each of them Mr. Shaw had a significant relationship.

A GOOD MAN'S MEMORY.

HENRY SHAW'S HANDSOME TRIBUTE TO DR. CHARLES A. POPE.

IMPRESSIVE SCENE OF THE GROUND HAPPILY SELECTED FOR CEREMONY.

About 23 years ago one fine spring afternoon while Mr. Henry Shaw was busily engaged in planting some shrubs in the then comparatively new Missouri Botanical Garden, Dr. Charles A. Pope, the famous surgeon, walked in with a package in his hands and said he had a plant just received from the Rocky Mountains. He tendered it to Mr. Shaw, and planted it with his own hands. It was a specimen of the Yucca, or Spanish Bayonet plant.

Since then it has grown and thrived . . . now of monster growth, covering over a yard of ground. Since then the man who planted this specimen has passed away, and yesterday, on the very spot where he stood years ago, spade in hand, to plant his gift, a throng of his friends gathered to conduct a memorial service, devised by the venerable philanthropist, Mr. Henry Shaw, the "rare old English gentleman—one of the olden time."

Near the great Yucca with its flowers, like two giant ears of corn, was erected an Italian marble slab about two feet high set in a base of sandstone. The slab bore the inscription:

YUCCA
(ANGUSTI FOLIA)
PLANTED IN 1860
BY THE LAMENTED
DR. CHARLES A. POPE
PLACED HERE
IN MEMORIAM
BY H.S.

Over sixty invitations had been sent out by Mr. Shaw to gentlemen who had known the lamented Doctor during his busy, eventful and honored life. The weather during the entire day was not only threatening but provoking. The sun would shine brightly for a minute or two and then ugly clouds would obscure it. Occasionally, raindrops fell and it would seem that the weather would have a bad effect upon the attendance at the ceremony which was set for 5 o'clock P. M. Notwithstanding . . . about thirty gentlemen put in an appearance . . . and all were received with the hospitality for which the proprietor of the beautiful gardens had been for years noted.

---

[1] Style and characteristic expressions identify the journalist as undoubtedly Mr. Thomas Dimmock, who, since the 1860's, had been a leader in the local press and an editorial feature writer at times on the *Republican*.

His old friends, and many of them friends of him whose memory was commemorated, gathered around and were shown about the gardens, beautiful in the clear sunlight after rain and radiant with the profusion of buds and blossoms of every hue and size.

The new conservatory was visited by the party, every member of which was pleased with the place so admirably fitted up for its purpose. Above the entrance were three beautiful busts—Linnaeus in the center, and Nuttal and Dr. Asa Gray on either side.[2] Mr. Shaw chatted interestingly of the flowers and plants of which it had been his life's labor to gather together and arrange in this grand open-air botanic museum.

After a very pleasant time thus spent, the party moved to the spot where had been erected the memorial slab. Mr. Shaw, stepping from among his guests, read the following address, fully explanatory of the . . . motives of the ceremony:

ADDRESS OF HENRY SHAW.

> Here, gentlemen, is a living monument to our lamented friend. He took an earnest and kindly interest in the success of these botanical gardens, at their commencement twenty-five years ago, and often encouraged me to persevere in the undertaking by expatiating on the future benefits to the country and to the cause of Natural Sciences, by the collection and arrangement of plants, the production of various countries and climate—An American jardin des plantes, as he good-naturedly called it.
>
> When in Europe he forwarded me information in regard to similar institutions there, and called the attention of Sir William Hooker, the celebrated botanical writer and director of the London Kew Gardens, to our intended establishment at St. Louis. For his kindly feeling to myself, personally, and sympathy with my exertions, I bear a profound respect to his memory, which I feel convinced, is participated in by those around me, for on this very spot where we are now standing, on a pleasant springtime evening, engaged with laborers around me, preparing the land for planting, he came up with a plant in his hand, accosting me in his usual friendly and cheerful way, saying, "I bring a plant just received from the Rocky Mountains."
>
> Delighted by the mark of his kind interest in the gardens, I invited him to plant it, which he did with his own hands, the first herbaceous specimen set out in these gardens, now twenty-three or twenty-four years ago.
>
> A living monument to his memory, and, apparently for all time, this plant proved to be the Yucca-Angustifolia—Spanish Bayonet plant, growing spontaneously in Colorado and named by Pursh from the specimens collected by Governor Lewis on his journey with Clark across the continent in 1804.
>
> Our Southern colonists in Carolina and Georgia adopted the Yucca by reason of being armed with a formidable bayonet-shaped sharp pointed leaf, as a defense against Indian foes, planting it thickly around their wooden stockades or forts and, from its palm-like appearance, called it "palmette." But later, a nobler and loftier tree, growing in the southern coast of Florida and the Bahamas, called by distinction, the palmette royal, was adopted as the symbol of the South . . .
>
> Dr. Pope was a favorite among all classes. Accomplished, benevolent, liberal and warmhearted, he had friends everywhere; all acknowledged the nobleness of his character. Better than myself, you know his professional attainments and accomplishments, for I understand there are some present here who were his pupils. This plain marble slab simply tells the world that Dr. Charles A. Pope was a patron of the Missouri Botanical Garden and hopes, as a memorial, it may meet the approbation of his many friends here present.

At the conclusion of Mr. Shaw's remarks, which were applauded heartily, there were calls for Dr. Gregory[3] . . . Mr. James E. Yeatman being called upon, said:

---

[2] Probably one of the earliest public references to the Linnaean House, just completed in 1882.

[3] Elisha Hall Gregory, M.D., (1824–1906). A pupil of Dr. Pope, and graduate of his medical school (1849), Dr. Gregory became a faithful and loyal surgical adjunct of *(Cont'd)*

> You know I am not given to many words. Dr. Pope was truly a beloved friend. I had known him long before I came to St. Louis. He met me first upon my arrival and mine was the last hand that clasped his when he left us for the last time on his trip to Europe. My love for him was more than that of a brother. There was scarcely a day that we were not together. My home was his, and his Sabbath-day dinners were taken at my table. Although I was not with him when he married, I met him shortly afterward in New York and accompanied him on his bridal tour. In Paris it was his custom to visit the hospitals at an early hour each morning, I, being his constant attendant, until one morning there were some experiments which he thought beautiful, but which made my knees rather unsteady and thereafter I used to wait for him at a nearby store until he was done with the experimenting. It is pleasant to the living and a tribute to the memory of the dead to know that he is cherished in the hearts of many. By every man and every woman in the city who knew him, this last tribute will be accorded.

At the end of Mr. Yeatman's address a rainstorm came upon the grounds and an adjournment was taken to the pagoda where the program continued. * * *

The party then adjourned to the Shaw mansion where some of the rich and rare old wines were opened to the guests and the memory of Dr. Pope was drunk in silence and the memory of the living was not forgotten, and again and again the health of Mr. Shaw was drunk. Dr. T. S. O'Reilly made a few touching remarks upon Dr. Pope and the affair came to an end very pleasantly.

Those present were:

John J. O'Fallon
Dr. George Engelmann
Dr. Thomas O'Reilly
Dr. J. S. B. Alleyne
Dr. Charles W. Stevens
Dr. E. H. Gregory
Dr. H. J. McKellops
George L. Barnett
Joseph H. Sheets
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D. H. McAdam
Fred L. Billon
Adolphus Meier
J. E. & D. F. Kaime
M. A. Doyle
P. L. Foy
B. W. Alexander
W. H. Thompson
Hugh Campbell
Michael Keeber
Girard B. Allen
Edwin Harrison
John Knapp
Walker R. Carter
James E. Yeatman
George W. Fishback
D. G. Evans

This concludes the press account of the gathering. None of those present are alive today. Only the greying, time-weathered and nearly obliterated "slab" remains as a symbol of one man's esteem for another.

YUCCA AND BIOLOGICAL RESEARCH AT THE MISSOURI BOTANICAL GARDEN

Scientifically the Garden's first conspicuous triumph concerned the discoveries made here by one of the leaders in the developing science of entomology, Dr. C. V. Riley. He was then the State Entomologist of Missouri with headquarters in St. Louis. He used the facilities of the developing Botanical Garden and it was on our Yucca plants that he made his scrupulously detailed studies of the way they are pollinated.

When the American Association for the Advancement of Science in 1872 gathered for its annual meeting in Dubuque, Iowa, the biggest sensation was Dr. Riley's first public report on Yucca and the pollination behavior of the Pronuba moth.

Dr. George Engelmann, Mr. Shaw's

Dr. Pope and a figure of national renown in his field of medicine. He was once hailed by Dr. V. P. Blair as the "Master Surgeon of America."

friend and scientific advisor, was the American authority on Yuccas and had persuaded Dr. Riley to look into their pollination since it was evident that certain insects must be doing an efficient job and that without them few or no seeds could be produced. Riley's careful studies showed that while some of the furry white moths which flew around the flowers were just gathering pollen for their own use, the female Pronuba moths were cooperating with the Yucca plants in an amazing kind of way. These little creatures, not as big as the last joint of your little finger, would gather a ball of pollen, then find a seed pod just ready to develop, and lay some of their eggs where they would hatch into larvae and feed on the growing seeds. Then the moth would go to the receptive stigma of this still virginal maternal tissue and pollinate it thoroughly with Yucca pollen. It was an outstanding example of the intricate kinds of cooperation between plants and animals to which Darwin's discoveries had turned men's minds. The moth larvae had plenty of delicious young Yucca seeds to feed on when they hatched and a nice safe place to live in as they developed. Yucca got its stigmas expertly pollinated and there are so many seeds in a Yucca pod that it was not hampered by having a portion of them eaten eaten up (though neat gardeners are sometimes distressed by the way Pronuba punctures destroy the symmetry of otherwise handsome seed-pods).

Dr. Riley's speech at Dubuque and the papers he soon published in the *Transactions of the St. Louis Academy of Science* and elsewhere, set off a fierce world-wide debate on the Pronuba story. Fairly early in the controversy a prominent scientist who was not as meticulous as Dr. Riley about indentifying the insects he observed, attempted to refute the account. He watched another kind of little white moth which used the pollen but did no pollinating and reported this as the behavior of the Pronuba moth! As the result of his sloppy work the argument went on much longer that it needed to. However, by the time Mr. Shaw gave his memorial tribute to Dr. Pope, Riley's work on Pronuba was being widely confirmed and talked about and Pope's gift of a Yucca to Henry Shaw, (the first herbaceous plant established in the Garden) had become the nucleus of a growing collection of Yuccas.

When Dr. William Trelease became the first director of the Garden, he intensified his own botanical studies of Yucca and became an authority on the genus. In 1892 in the scientific supplement to his third annual report, he and Dr. Riley published a monographic account of the whole Pronuba story.

When Dr. Pope brought this Colorado Yucca plant to start off Henry Shaw's collection, it was the first step in a sound program of biological and horticultural research. Dr. Pope and his *Yucca angustifolia* well deserve their marble marker and we are all indebted to Dr. Shankland for bringing the details of the ceremony to our attention

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5 Sessions—Fee $12.00. *Experimental Greenhouse* (reached from 2221 Tower Grove Avenue).

Tuesday Evenings—8 to 9:30 P. M. October 12, 19, 26, November 2, 9.

Thursday Afternoons—1 to 2:30 P. M. October 14, 21, 28, November 4, 11.

Instructors: Mr. Clarence Barbre, Mr. Kenneth Peck.

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New techniques and apparatus are coming up rapidly. Latest ideas and equipment for the amateur or professional will be discussed and illustrated. Morning lecture, informal lunch, afternoon trip to visit artificial light installations.

One Session—Fee $5.00. Meet at *Museum Building*, 2221 Tower Grove Avenue (opposite Cleveland Avenue). Saturday—10 A. M. to 3 P. M. October 9. Come and bring your lunch; coffee will be provided.

Instructor: Prof. Robert J. Gillespie.

SATURDAY PROGRAMS FOR CHILDREN

in September and October

No fees. No registration required.

Place: *Museum Building* or *Research Greenhouse* (Enter at 2221 Tower Grove).

Time: 10.00 to 11:30 A. M.

Instructors: Mr. Kenneth Peck and his staff.

SEPTEMBER

4 "The Mighty Oaks." Make collections of important species to take home.

11 "The Hundred-in-One Flower." Study early fall flowers belonging to Sunflower family.

18 "Devil's Footstools." Mushroom demonstration including story of penicillin.

25 "Nature Movies." Three color-sound movie films.

OCTOBER

2 "Planting Bulbs." Paperwhite narcissus bulbs planted to take home. (Bring a 1 lb. coffee container.)

9 "Fall Treasure Hunt." Field trip in Garden. Contest and prizes for solving riddles and trail finding.

16 "Fall Colors." Draw or paint scenes in Fall color.

23 "The Forests of the Rocky Mountains." A travelogue illustrated with slides.

30 "Nature Movies." Three color-sound movie films.

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Frank Steinberg, Superintendent of the Arboretum, Gray Summit

George B. Van Schaack, Librarian and Curator of Grasses

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

October 1965
Volume LIII
Number 8

COVER: Portion of a TAPIOCA plant in full bloom. The fully expanded flowers are about the width of the tip of a little finger.

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A Charming New Weed

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LIII No. 8 October 1965

TAPIOCA AND THE CLIMATRON

The plant from which we get our tapioca, *Manihot esculenta,* has made an interesting display in the Climatron. It quickly grew into a bush just as it does in the tropics. In spite of having been repeatedly headed back, it is now the size of a small apple tree. Except for short periods immediately after these dehornings, its graceful narrow-fingered leaves have been abundant and attractive, while the small, greenish-yellow flowers have been borne freely enough to add interest to the foliage.

This is the great starchy root-crop of the tropics, which at the equator is grown all the way from sea level to above 8,000 feet. Where it is being intensively cultivated it usually gets little chance to become very bush-like. As soon as the roots are of moderate size, the whole field or plot is dug up and harvested and another crop is planted. There are many varieties and they vary in their height and bushiness, in the size and color of the roots, and in the shapes and sizes of the leaves. One of the world's foremost tropical botanists questioned the label on our Climatron specimen and was not really satisfied until we found a few flowers which confirmed the label. In the tropics, big, old specimens of this sort are not seen in cultivated fields but are common in country dooryards or in orchard-gardens mixed in with the coffee bushes, fruit trees, and gourd vines. Under such circumstances the starchy roots can get as big as a man's leg.

For a world in which more and more people are starving to death each year, *Manihot esculenta* is one of the hopes for the future. Unfortunately in the temperate zone we are familiar only with its incidental uses in packaged tapioca pudding or as old-fashioned "Pearl Tapioca." Throughout the tropics it is a common starchy food, boiled up like rather gluey mashed potato or French fried in thin slices, which can be quite delicious when carefully prepared. Its commonest names there are mostly some variant of the following: Yuca ("yew-kah"); Manioc ("mahniock"); Cassava ("cahsahvah").

It is a good thing that St. Louis school children are getting to know it at the Climatron. Intelligent World-Citizens of tomorrow will need to know about it and appreciate what it can and can't do.

E.A.

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BOOK REVIEW

The Picture Book of Perennials by Arno and Irene Nehrling, Hearthside Press, New York, 286 pp., $5.95.

THIS book is divided into three parts. First, all of the perennials available today are listed alphabetically and many are either pictured in halftones or by line drawings. The text describes each plant, lists the varieties, gives the height and time of bloom and other pertinent facts. Part II takes up the various gardening practices of soil preparation, planting, feeding, watering, mulching, thinning, staking and disbudding. Insecticides and fungicides are listed and their uses indicated for the pests and diseases which attack plants at times. Propagating plants and the coldframes in which to grow them are described and illustrated with drawings. There are numerous photographs of garden layouts and the fundamentals of design are dealt with at length. A Calendar of Things to Do in each month of the year is a good reminder of the many gardening operations to perform in the course of a year. Perennials are grouped for various situations and purposes: sun or shade, rock garden or cut flowers, fragrance, color, ground covers and those needing frequent or infrequent replanting. Although the blooming time of perennials is for the northeastern United States we can expect the blooming sequence for this mid-west area to be two weeks to a month earlier.

The Picture Book of Perennials would be a good choice for anyone interested in planning, planting and maintaining a perennial garden.

P. A. KOHL

WHEN THE GARDEN'S VICTORIAS MADE A REAL SPLASH

An article in the May Bulletin has brought us an interesting letter from Dr. A. T. Erwin. He was one of the first students in our former School for Gardening and afterwards transferred to the School of Botany and studied under Dr. Trelease. He writes as follows:

"Your article on the Victoria water lily brings to mind many pleasant memories, for I was there the year the first one flowered. You show a child on a leaf but the one I helped with weighed at least a hundred pounds. The papers gave the plant quite a write-up and announced there would be a demonstration. The crowd gathered and I was assigned the job of escorting the young lady out on a gang-plank to the leaf. All went well until she waved to the crowd, when she lost her balance. The leaf shot out from under her and I grabbed her. She really got the hug of a lifetime and the crowd laughed and cheered."

A CHARMING NEW WEED

Professor and Mrs. Joseph Klarmann of the Friends of the Garden found a strange weed along the edges of their lawn in Oakland. It is the so-called Mock-Strawberry, *Duchesnea indica,* a curious little plant almost exactly intermediate between a strawberry and cinquefoil *(Potentilla).* Steyermark does not record it as native to St. Louis County though it is known to five other Missouri counties.

This is a species which one of us knew well in the Shenandoah Valley. The plants discovered by the Klarmanns differ from it and we have looked into the literature about it. The authorities seem to be describing two things. One has leaves and fruit heads as large as a small strawberry, handsome enough so that it is sometimes planted as a ground cover yet weedy enough so that it spreads locally. The other, like the one in Oakland, has a dry little head, covered with dried-down crimson seeds. The one in Virginia also has seedy, tasteless heads but they look enough like strawberries to be frequently picked and tasted by newcomers.

It will be interesting to see if the Oakland form will become more ornamental when grown in a garden. However, we have a growing suspicion that in this country there are both a weed and a cultivated race, selected by Nature and by Man for differing careers.

Edgar Anderson and
Dorothy Marcrander

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

November 1965
Volume LIII
Number 9

COVER: A cast, in sterling silver, of a branch from Ponderosa Pine. One example of the techniques worked out by Dr. Gates in his studies of the energy trapped by vegetation. See pages 6–7 for further discussion.

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

Vol. LIII No. 9 November 1965

DAVID M. GATES, THE NEW DIRECTOR

By EDGAR ANDERSON

When Dr. Gates, known around the world as a physicist, arrived in St. Louis in early September he was returning to the field of his early interests. His first scientific paper (written as a high school senior) drew on discoveries made in his early teens on field trips to Sleeping Bear Dune. The trips were official ones by ecology students from the Biological Station of the University of Michigan at Douglas Lake. To understand Dr. Gates' professional career one needs to know about Douglas Lake for it was there he spent his summers from the time he was a year old until he entered the University.

The Douglas Lake Station was in those days an almost ideal environment for a bright youngster. For him even its deficiencies (many of which have since been removed) were very real assets. It was in the "cutover lands" just south of the tip of the southern penninsula. At the end of a charming little lake were a few mouldering log cabins and some tar paper shacks for the staff. On a sandy knoll were rough "temporary" buildings, some of them left over from lumbering days, which with much ingenuity and little money were made into mess halls, dormitories, classrooms and laboratories. Winding sandy roads led off to such summer centers as Charlevoix, but in those days it took skill, determination and luck to get there in a reasonable time. On every side stretched a ravaged but varying wilderness, second growth timber, little islands of uncut lumber, bogs, lakes, burned-over country, brush, hardwoods and softwoods. Organic nature in fascinating variety began at your doorstep and sometimes invaded your cabin. A small staff of outstanding investigators and teachers shared these privileges and hardships for year after year. Some of the staff and many of the students were on summer leave from other institutions. The Parasitologist, W. W. Cort, was from Johns Hopkins; H. B. Hungerford, the Entomologist, came from the University of Kansas. Dr. Gates' father came from Kansas State where he, Frank C. Gates, was Professor of the young science of Ecology, the study of how plants and animals react with each other and how they are affected by the environment in which they live.

It was a healthy life, just rugged enough. Tramping through sand hills, bogs, and brushlands put muscles on Gates' wiry frame and helped in making him a devoted tennis player who is now happy in finding Tower Grove Park's excellent courts across Magnolia Avenue from his official residence. From this boyhood came part of the stamina which as a National Sigma Xi lecturer in 1962, allowed him to give 30 formal public lectures in 42 days. He was wise as well as rugged, however, and scheduled his visit to the University of Hawaii in the middle of the series. There he took time off and "rested" by studying the types of vegetation in the islands and their varied environments, rain forests to desert, sea coast to mountain tops.

During his boyhood, though his Douglas Lake summers deepened such zoological interests as entomology, he continued to be drawn into various botanical activities, some of which were important enough to become matters of public record. In the Garden's Herbarium there is a "voucher" specimen of *Tradescantia bracteata*, listed in technical scientific papers as "Gates-1" because it came from a plant furnished "by David M. Gates" who in 1931 collected it, the record goes on to say, along the RR tracks near Manhattan, Kansas. In High School, however, he took fire when introduced to the mathematical precisions of physics. As not infrequently happens, these mathematical gifts were accompanied by a keen interest in music. He went far enough with the clarinet to be selected as the Kansas representative in a national contest. Though he laid the clarinet aside as he grew older, he retains an almost professional interest in orchestral and chamber music.

Gates' college training was all at the University of Michigan, with a B.A. in '42, an M.S. in '44, and a Ph.D. in '48. Though he continued to be unhappy about leaving biology behind, his graduate training was in physics. Some leading scientists, even then, however, had not given up hope of eventually luring him back into biological circles, for he held the first graduate Fellowship in Physics provided by the National Institute of Health. Though he had offers to work in the East in the field between physics and medicine, he took a Professorship of Physics at the University of Denver. He wanted to get experience teaching and he preferred, for a time at least, to live in the West. Continuing in the general direction of his graduate years, he and his students from 1947 to 1955 studied such matters as the spectrum of the sun, and atmospheric physics. Among other things they carried on some rather spectacular investigations, using high altitude balloons to extend Man's precise understanding of his world farther and farther away from the earth's surface.

These activities led to his being chosen to serve for two years on the staff of the U. S. embassy in London as a liaison officer with the scientists of western Europe. He took the appointment, planning to be one of a dozen Ph.D.'s serving under a more experienced Director. The latter, however, had a nervous breakdown and Gates was first made Deputy Director and then Director. This gave him unusual administrative experience for a young scientist and a vast understanding of officialdom in our own and other countries. It also gave him a

Dr. Gates and graduate students securing a trough and container to measure how much of the rain flows down the trunk. It was 10 times what fell directly!

PHOTO COURTESY OF MURRAY GATES

personal acquaintance with many of the world's leading scientists. He and his family lived in London at Knightsbridge; though he was away from home about a third of the time visiting European scientists in their universities, laboratories, and homes and at professional meetings. One of his main functions was to put scientists in touch with each other; particularly those who were working on similar problems in our own and other countries.

After these two exciting (but certainly very strenuous) years he returned to this country and to lead a research group in atmospheric physics, set up by our government's Bureau of Standards adjacent to the campus of the University of Colorado at Boulder.

It would have seemed that he had turned his back on biology forever but, in reflective moments, he was beginning to think about what has since blossomed into a new field of biological research. While he was still Professor of Physics at Denver he began to turn a basic ecological problem over in his mind from time to time: the interrelation between a plant or animal and its physical environment. The new understandings and the new techniques which were developing in physics, it seemed to him, could revolutionize this aspect of ecology and in doing so revitalize the whole subject. Just before leaving for his two years in London he sat down with his father (so sound and alert that it never occurred to the younger man that he would never see the old gentleman again) and the two of them threshed out the whole subject in a heart-to-heart conference. How could one bring the rigours of physics into ecology in such a way as to make it not only qualitative but effectively analytical, not merely piling up precise data but organizing experiments in such a way that they could answer basic questions and thus lead to new experiments which would probe still more deeply. It would be difficult but not impossible to redesign the methods and instruments of a physics laboratory so that they could be applied to the far greater complexities of a living plant. In what kinds of ways might he start out to determine precisely how the environment is coupled to the plant? Could he eventually understand what one might call the "housekeeping" of a living cell so perfectly that he could make up a kind of "energy budget" for the plant, demonstrating exactly where the energy came from, the ways it entered, and what it did? Along with this growing idea was a practical, everyday difficulty. In what kind of university or laboratory could the younger Gates get a chance to work on such problems? As trappers of energy, plants play a central role in such budgets. Yet, would any American Botany Department accept a man, however able and however knowledgeable about plants, who did not carry the "union label" of at least one earned degree in Botany? These were some of the deep concerns he carried with him to the London Embassy. Gates had much to mull over as he shuttled back and forth across Europe for two years by planes and trains and motor-car.

The opportunity to try out his new ideas in public came almost too soon. The call came when he had just barely settled down with his new job for the Bureau of Standards at Boulder and was occupied with such matters as the Bureau's participation in the International Physical Year. Precise data had to be gathered, integrated, shared, interpreted and discussed. In the midst of these and other concerns came a special request from Douglas Lake. The University of Michigan planned to celebrate the fiftieth anniversary of the Biological Station with a four-day celebration the next June. They wanted him to be one of the four main speakers and planned to publish his address in full in the Official Semicentennial Proceedings.

The timing was close, but, of course, he couldn't possibly refuse. He got official permission to take a month off and work on his address; in its published form it marks the beginning of what has become a whole school of biophysical ecology. He began on a movingly personal reference to his father and quickly got down to fundamentals.

"Having had the great good fortune of the close association for many years with the late eminent plant ecologist, Frank Caleb Gates, to whom this paper is dedicated, and having strayed from the fold into physics and atmospheric physics, I now with great pleasure and enthusiasm return to a subject which has never been far from my thoughts. One cannot have spent eighteen years of association with the field biological sciences without being inspired by so challenging and rewarding a subject. I hope that in this paper I can suggest some cross pollination of ideas between physics, atmospheric physics and ecology. * * * It is fascinating to consider the widely different vegetative associations occurring in nature—tropical rain forests, savanna and grasslands, deciduous and coniferous forests, tundra and deserts. * * * To me these differences in vegetation suggest one simple important factor to which everything else is related—energy.

"* * * Let me say first off, as a physicist, I have always admired the biologist and extended to him my condolences, for his subject is much more complex than the physicist's. The physicist can rather easily conduct an experiment with only one or two variables, but the biologist is confronted with a multitude of variables all interacting at once. * * * It is time to have a theoretical quantitative discipline in the field biological sciences which will work closely with the field research biologist. I wish to discuss certain aspects of this discipline, in particular, the energy regime of environments."

The response to this lecture was almost immediate. Some of the country's ablest ecologists were beginning to think along such lines. The time was ripe. Within a year he was being pressed to come to the University of Minnesota and give a course in this field. He finally settled on coming to give a general lecture to the Minnesota chapter of Sigma Xi, followed by four more specialized lectures. The response there was immediate and enthusiastic. Botanists, zoologists, foresters, entomologists, soils-experts, packed the lectures and took every minute of his time. Significantly the local physicists were not interested even though the main lecture was a general one for all branches of science. This demonstrated that Gates had been correct in his previous judgment that "a theoretical quantitative discipline" must be set up *within* the field-biological sciences.

The subject of the lecture was developed into a book-sized monograph, *Energy Exchange in the Biosphere*, Harper and Row, 1962. A polished version of the Minnesota lecture, "The Energy Environment in Which We Live," became the Sigma Xi–RESA "National Lecture" for 1962-63, on the West Coast and Hawaii, which has already been alluded to. Though the lecture schedule was taxing, Gates particularly appreciated the long critical group discussions and informal sessions with able biologists on such campuses as the University of California at Davis. These removed his last lingering doubts as to the importance and urgency of his new program.

Opportunities opened up on every side. He gave an advanced course in Biophysical Ecology at the Institute for Arctic and Alpine Research. He went back to Douglas Lake one summer and taught Ecology, staying in the same tar-paper shack he lived in as a boy. He collaborated with biologists of the Carnegie Institution at Palo Alto. Papers by him and his students

Teaching a graduate Ecology class, Douglas Lake, 1964. With a heat detector Dr. Gates demonstrates that some kinds of leaves with such features as better water-cooling systems may be 10° (F) cooler than others in the same woodland.

PHOTO COURTESY OF MURRAY GATES

and collaborators began to roll from various presses. (He tells us that he gets up early in the morning and does such writing before ten o'clock.)

Gates got this new field of investigation off to a rapid start through his remarkable ingenuity in adapting the techniques of physics laboratories to the complexities of living plants. On his office desk at the Garden there is a token from these experiments of a few years ago. Sealed in a glass cylinder (not unlike those once used to display wax flowers) is an intriguing shape. Seen across the room it is in some ways the perfect embodiment of some plant form or other, and yet it is most unplantlike. It has, for instance, a luminous, graywhite, overall effect. It is rather like a delicate, streamlined bit of modern sculpture in metal. Seen close at hand, the mystery deepens; in its shape it is a perfect image of a Yellow Pine branch, yet it has a soft, ghostly glow. This is really no wonder for it is a *sterling-silver casting of an actual branch* from that species of pine. This is one of the devices Gates worked out in getting precise energy budgets for several kinds of western conifers. Among the things he had to know if such a budget were to be calculated, were the actual surface area of the branch and the "effective area" which absorbed sunlight. With a sterling-silver casting and an inventive mind one could hook up a variety of laboratory instruments in such ways as to yield the basic readings. By drawing up the proper mathematical equations and inserting these figures one obtained the precise items for the budget. As a technique, it was far easier than using the branch itself—and incomparably more accurate.

Some of the details of making the silver casting are so practical as to be almost comic. In making the enamel cast and in removing the remains of the original twig, Gates employed materials and instruments used in fabricating artificial teeth! The original paper in the *American Journal of Botany* for 1964 describes the operation in precise and dignified scientific language: "A portion of the tree was invested in a dental investment compound and fired at 2100° F. until no trace of the branch remained in the investment. Then molten silver was induced into the void left by the branch in the investment by a centrifugal slinger, thus forming a casting of the branch * * * . The change in size in forming the castings in this manner was less than 1%."

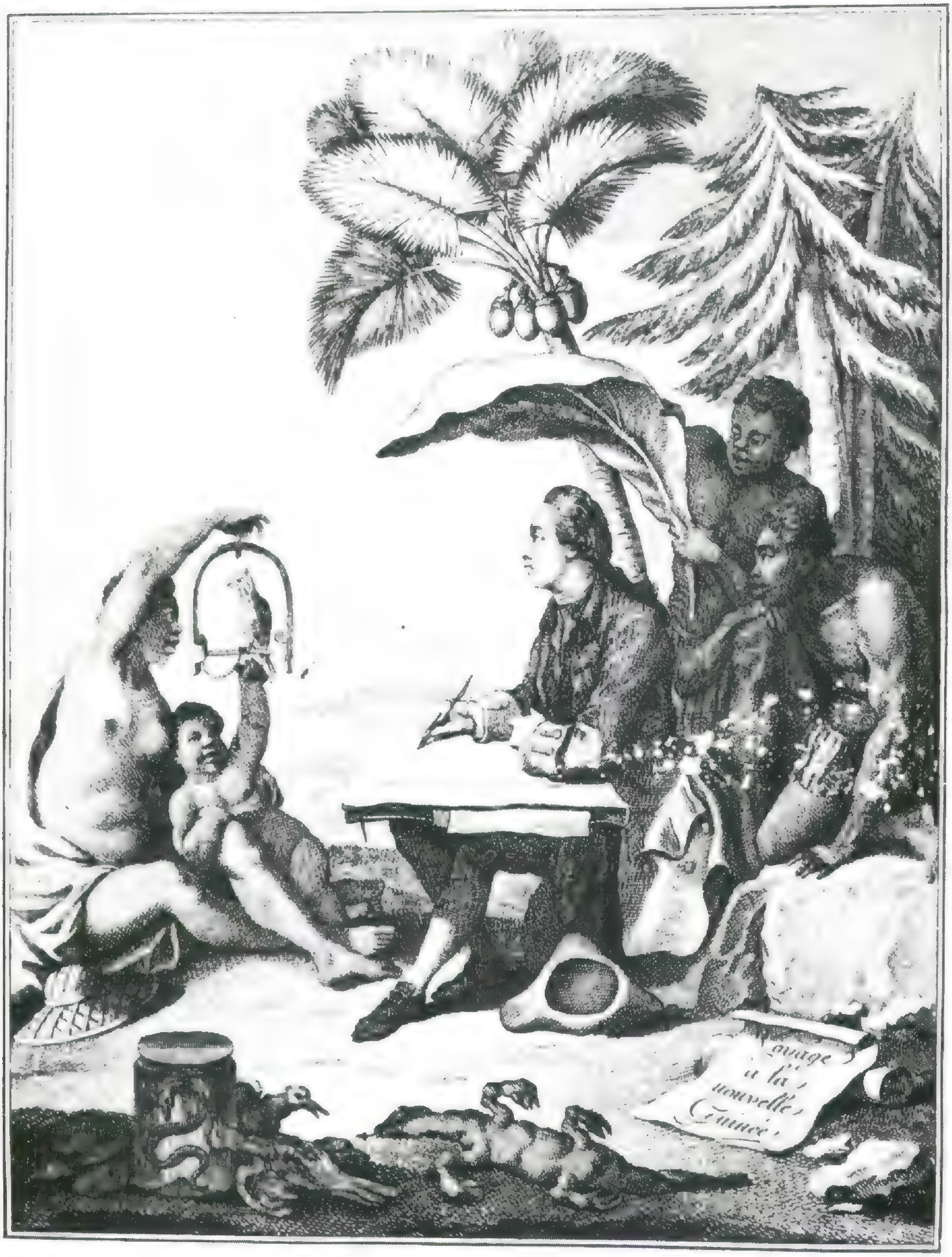
With such bursts of creative technique the whole program for a "dynamic ecology" continued to grow and proliferate. Only a scientist who was dedicated as well as able could have participated in designing and publishing so many critical experiments in a few years and have also carried on his other duties as a scientist, a father, and a citizen.

New opportunities opened up on the neighboring Boulder campus. The Board of Regents of the University of Colorado created an interdisciplinary professorship. It was created with Gates in mind as a "Professorship of Natural History." In many ways it surpassed anything he had hoped for, but (perhaps from his New England Puritan ancestors) he has strong convictions about how his gifts ought to be used. One week before he was due to go on this payroll, he had a call from the Garden's Board of Trustees. He looked into the possibilities and problems in St. Louis. He pondered long and deeply over this new challenge.

"It was," he says earnestly, "something I could not refuse."

* * *

CHRISTMAS SHOPPING DONE? The new Garden Gate Gift Shop at Shaw's Garden offers a delightful and unusual selection of gifts for your friends who love flowers and garden accessories, as well as those hard-to-please friends who seem to have everything.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Sonnerat beneath a *coco de mer* palm, from the frontispiece of his book published in 1776, the first known picture of the tree. See page 10.

PHOTO J. D. SAUER

THE SEYCHELLES ARCHIPELAGO AND ITS PALMS

JONATHAN D. SAUER

THE Seychelles lie just south of the equator in the open Indian Ocean about 1000 miles east of Zanzibar and 600 miles north-northeast of Madagascar. Excluding outlying coral islets, geographically separate although under the same British Colonial administration, the archipelago is a compact group of some 30 small granitic islands. For their size, the islands are rugged, with many great cliffs, tumbled piles of boulders, and rock peaks, some nearly 3000 feet high and often covered by clouds and mist.

The climate is nearly ideal for growth of most tropical plants: continuously warm, much sunshine and gentle breezes, free from storms and hurricanes, with abundant rain during the northwest monsoon and frequent quick showers during the southeast trade season. Patches of vegetation colonize even the steep slopes, wherever there is any foothold in ravines or crevices, and the gentler slopes are blanketed with trees, now mostly coconuts. The combination of clean, blue sea, fringing reefs, lush vegetation, and towering masses of rock produce a landscape of unearthly beauty.

The apogee of response to this special place came from the heroic General Gordon, becalmed here briefly a few years before his death at Khartoum. Gordon believed that the Seychelles, and precisely the island of Praslin, might have been the actual Garden of Eden. It seems most fitting that he identified two species of palm, the *coco de mer* and the coconut, as the tree of knowledge and the tree of life. Among all the rich Seychelles flora, these two palms have most stimulated human curiosity and satisfied human needs.

Gordon's tree of knowledge, the *coco de mer* or double coconut, is a fan palm of the genus *Lodoicea* and is not closely related to the true coconut. It is the most famous of six genera of palms and hundreds of other kinds of plants and animals that are peculiar to the Seychelles. These strange, endemic organisms have been adduced as evidence that the Seychelles are a remnant of some ancient, foundered land mass, called Gondwanaland or Lemuria in different hypotheses. However, the present submarine ridge on which the island's lie is surrounded by great trenches thousands of fathoms deep. The peculiar flora and fauna may be simply derived from rare migrants that arrived, one by one, across the sea by long-range wind, bird, and ocean current dispersal. The descendants of these waifs then may have become distinct from their relatives in the outside world by gradual divergent evolution.

There is no evidence that the modern *coco de mer* is capable of long-range dispersal. Although the nuts float indefinitely, they are not known to remain viable in salt water and, in any case, the species has separate male and female trees so that germination of isolated nuts would be ineffective for colonization. Alive or dead, stray *coco de mer* nuts have been found on the beaches of southeastern Asia and the East Indies since antiquity. Being the largest of any seeds, curiously shaped, and completely mysterious in origin, they were regarded as one of the wonders of the world. Shells of the nut were made into drinking cups to confer immunity to disease or poison. Bits of the actually innocuous copra were traded through Asia and even into Europe as a medical panacea. The Maldive Islands were the most favorably situated part of the known world for intercepting Seychelles drift, and ancient Maldive kings claimed any of these fabulous nuts that washed up on their beaches as a royal prerogative, probably with considerable conviction, since a single nut could be traded for a whole ship loaded with ordinary goods. A Maldive king once commissioned an expedition in a vain search for their source.

There were legends that sailors had seen the *coco de mer* tree growing deep beneath the sea in clear bays off Java. Malay pilots told Magellan's companion, Pigafetta, that the nut came from a big tree standing above the waves at the navel of the ocean and that in it was the nest of the Garuda bird that preyed on elephants. This recalls Marco Polo's tale of the roc, the gigantic eagle that carried off and devoured elephants. An envoy of the Great Khan, sent after this creature, is said to have returned with a palm frond that he offered as a quill of the roc. Old Arab charts place the islands of the roc in the Indian Ocean, but the geography is too flexible to tell whether the legend is rooted in Madagascar or the Seychelles or some imaginary place.

Right after 1500, Portolan charts began showing islands in the Indian Ocean that have been interpreted as representing the Seychelles. Assuming they represent actual Portuguese sightings rather than legends, sorting out the many different Indian Ocean islands on these inaccurate old maps is a baffling puzzle.

The first recorded landing in the Seychelles was in 1609, when a British East Indiaman, the *Ascension*, anchored for a week in what long after came to be called Victoria Harbour. The sailors found plenty of palms ashore, as will be discussed below, but were not in the right place, the island of Praslin and its satellites, to find the *coco de mer* groves. Praslin was finally explored nearly 150 years later by French expeditions from Mauritius. The first naturalists to describe the *coco de mer* palms were Sonnerat and Abbé Rochon, who visited the islands about 1770. The first known drawing of the tree appears above Sonnerat in the frontispiece of his book (page 8).

Immediately thereafter the world market was glutted by nuts carried off by French and raiding British sailors expecting sales at king's ransom prices. The nuts became commonplace in Mauritius as sugar scoops and as rice measures in Chinese shops. In the Seychelles today, the shells are in humble service for bailing out fishermen's canoes. The nuts are sold as curios for a few rupees apiece to passengers on the monthly steamer from Mombasa or Bombay and a thousand or so nuts are still exported from the islands every year. *Coco de mer* palms are now planted here and there on various of the Seychelles Islands and a few

Coconuts planted on inaccessible granitic coast, Police Point, Mahle Island. See page 13.
PHOTO J. D. SAUER

specimens are growing in greenhouses and botanical gardens around the world.

In the home island of Praslin, groves of thousands of these trees, including some ancient males 125 feet high, are preserved in permanent reserves. These groves also harbor other kinds of endemic palms and an extremely rare black parrot. The Praslin parrot and the *coco de mer* are shown on the lowest and highest values, the 5 cent and 10 rupee, of the current Seychelles postage stamps.

The other five endemic palms, each belonging to a separate genus known only from the Seychelles, were originally present on more of the islands than the *coco de mer.* One, known locally as the *palmiste,* is as noble a tree as the *coco de mer.* The others, collectively known as *lataniers,* are comparatively small, graceful and slender. They grew as understory trees in the original forests and, along with some peculiar Pandanus species, dominated many steep, boulder-piled mountain slopes. As human population built up, the palms held on better than most of the native plants, having fairly good ability to regenerate in cutover or burned over sites, but they are no longer abundant. *Palmistes* have been much cut for their edible apical buds or "cabbage" and *lataniers* for their timber and, in any case, their territory has been largely usurped by coconut plantations.

The coconut, Gordon's tree of life, was well naturalized in the Seychelles in 1609, when the islands entered history. One of their discoverers described them as "a very good refreshing place for wood, water, coker nutts, fish and fowle, without any feare or danger, except the allagartes; for you cannot discern that ever any people had been there before us."

The fact that these and various other uninhabited Indian Ocean islands had coconut palms when they were discovered has sometimes been attributed to planting by unrecorded Portuguese or ancient Arab or Malay voyagers. This is a shaky deduction because coconuts are known to remain viable while floating in salt water, the distances different varieties might be dispersed by ocean currents being as yet undetermined.

No matter how it arrived the coconut certainly naturalized itself well. Starting in 1742, a series of French expeditions from Mauritius began exploring the Seychelles, leading to formal occupation and colonization about 1770. The explorers and early settlers harvested large quantities of wild coconuts from palms that they reported growing along the beaches of the various islands but never more than 10 or 20 paces inland. Theoretically, they were poaching on a royal reserve. Under general French colonial law, a coastal strip extending 50 paces inland from high tide was perpetually reserved for the crown. Fifteen years after settlement, the colonists were producing about 1,500 gallons of oil a year from nuts gathered along the beaches. During the 19th Century, even the theory of the royal coastal reserve was forgotten, and privately owned plantations today extend to the sea.

The idea of planting coconuts was suggested as early as 1771 but it was slow in catching hold. Originally the focus was on romantic attempts to establish spice gardens. During the French and early British period, all the standard tropical plantation crops and many rarer ones were tried in an effort to develop a commercial export product. None were more than temporarily successful. The ease of growing sweetpotatoes and manioc, the abundance of fish, and export of the magnificent native hardwood timbers permitted fairly steady population growth. At the end of the Napoleonic wars, when control passed to the British, the population was about 5,000, mostly slaves. In 1845, with liberation of the slaves and the consequent labor shortage, the old pattern of intensive plantation agriculture ended and the colony was left with no export crop and a deficit instead of the former surplus of subsistence crops. Some coastal coconut plantings had been started previously, but it was after 1835 that this low-labor crop was first planted extensively. It soon became the mainstay of the economy, primarily for export but with a variety of minor domestic uses: food and oil, the *poonac* remaining after expression of the oil serving for cattle feed, timber, thatch, fiber, and wine or toddy from the fermented sap of the inflorescence.

By 1850 many coastal sand flats had been planted to coconuts and about 50,000 gallons of oil were being produced a year. By 1875 plantations had filled the coastal flats and were being extended up the mountainsides, in places reaching 1500 feet elevation. Expansion was uneven on the different islands, on some continuing into the present century. Felicité was finally

Vanilla planted under coconuts, Praslin Island. The broad leaves of the vanilla orchid vine show plainly at the left of the picture. See page 13.

PHOTO J. D. SAUER

cleared and planted to coconuts between 1918 and 1927. Plantations were pushed too far up many slopes with infertile and readily eroded soil. The upper, marginal groves have yielded few nuts and have suffered greatly from attack by a native palm borer, which does less damage to coconuts on coastal sands. This pest is the larva of a beetle, one of many endemic insects associated with the native *palmiste* and *latanier* palms.

The single-mindedness and determination with which the Seychelles have been planted to coconuts is remarkable. One expects a low coral atoll to be blanketed with coconuts but it is amazing to see them ascending precipices that would challenge a mountaineer. Where crevices are inadequate, little terraces have commonly been built for individual palms and soil placed behind walls of coconut husks.

Most rural life on the islands goes on under the coconut canopy, often a double layer of green fronds above dry thatch. Papayas, mangoes, breadfruit, and all the other dooryard trees are set in a palm matrix. Patches of sweet-potatoes, taro, and other provisions commonly grow under partial shade of coconuts. The two secondary commercial crops, the carefully tended vanilla and the half wild cinnamon, are produced from an understory beneath coconuts (fig., p. 13).

It seems miraculous that few people are hit by falling nuts unless one believes the story that the eyes on the nut are to watch out for people below.

A few of the coconut palms are regularly tapped for toddy, fermented into a wine. Every day perhaps 15,000 or 20,000 nuts escape from their technical owners to reward their finders with food and drink. By local custom, being seen in the company of a single unidentified coconut is not actionable but unauthorized possession of coconuts in plural is larceny. The planters manage to divert nearly 90 percent of the crop into commercial channels.

The export trade switched from oil to copra about 1905 and only small quantities of copra are pressed on the islands for local oil requirements. Copra is prepared both by sun drying and by artificial heating with fires of coconut shell and husks. Much Seychelles copra is of superlative quality and sells for a premium price in India. Copra exports have averaged around 5,000 or 6,000 tons a year for the last 40 years. Although not a huge statistic in terms of world commerce, this represents the produce of about 40 million nuts a year, many of which have to be sought and carried out of inaccessible sites, husked, dried, and sacked by hand labor, and often taken through the breakers in a canoe to a schooner standing offshore. As copra must bear the main burden of support of the colony's dense and fast increasing population, presently about 40,000, attempts to increase yields have long been a major government and private concern.

The plantations were originally established with the so-called creole coconut or *coco seychellois*, derived from seedlings of the naturalized beach trees. The Seychelles coconut bears fewer and smaller nuts with thicker husks than the commercial varieties grown elsewhere. However, introductions of improved cultivated varieties have repeatedly ended in miserable failure. For example, of 15,000 Ceylon coconuts introduced in 1905, most had died prematurely within 20 years and a single unhealthy survivor remained after 50 years. Under good conditions, any variety of coconut normally has a productive life of 70 years and some continue bearing for over 100 years. The reason for the failure of imported varieties in the Seychelles is not entirely clear. They are said to be less resistant to the native palm beetles and less suited to the local soils than the creole variety. Also the creole coconut is preferred because the nuts fall of their own accord when ripe; a good tree drops a nut every day or so all year 'round rather than holding them for cutting in a seasonal harvest. Expert consultants brought in by the government have agreed that it is better to continue with the *coco seychellois*, which the people know and understand, improving it by selective breeding rather than attempting to replace it.

Thus the story of Seychelles palms has a rather curious upshot. After two hundred years of experiments with all sorts of introduced crop species, the colony has worked out an economy based on the first plant that its colonists met when they landed on the beaches.

Coconuts overhanging quiet beach on La Digue Island, Praslin Island in background.
PHOTO J. D. SAUER

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* * *

Why don't you join the crowd hurrying down Tower Grove Avenue to the Garden Gate Gift Shop? Christmas is almost here.

BOOK REVIEW

At this time in the history of the city, St. Louisans will be excited to find for sale a moderately priced book, ***The French in the Mississippi Valley*** (University of Illinois Press, Urbana, 1965, 247 pages, list price $6.75). Expertly edited by Dr. John F. McDermott of Southern Illinois University, this volume depicts the early history of St. Louis in particular and French activities in the Mississippi Valley in general. The unifying theme of early French influence in the region is clearly portrayed in a series of well-illustrated articles of which "Myths and Realities Concerning the Founding of St. Louis," "The Houses of French St. Louis," "St. Louis Families from the French West Indies," and "An Early St. Louis Poet: Pierre François Régnier" will be of immediate interest. Readers of the BULLETIN will certainly find "French Naturalists in the Mississippi Valley" by Dr. Joseph Ewan of the Botany Department of Tulane University an added pleasure.

Originally prepared for a conference observing the 200th anniversary of the founding of St. Louis by Pierre de Laclède, *The French in the Mississippi Valley* is now available from the University of Illinois Press, Urbana.

WALTER H. LEWIS

* * *

IS YOUR NAME CORRECT ON OUR ROSTER?

This is a perennial problem in the Friends' office. There is checking and rechecking; intelligent and devoted secretaries work at the problem. You'd never imagine the many ways in which error creeps in and stays in. A whole set of difficulties can begin when a membership application arrives from a downtown office with nothing to go by but the signature on the check.

You can help us by referring to the membership list in the October BULLETIN and finding out if *your* name is rightly spelled and rightly listed. If it isn't, just call Mrs. Gleason at TO 5-0440 or drop a postcard to the Friends' office. Two corrections have already reached us. The listings should be: Mr. and Mrs. Arthur B. Baer, Judge and Mrs. William E. Buder.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440

MISSOURI BOTANICAL GARDEN

Bulletin

December 1965
Volume LIII
Number 10

Christmas Spice

COVER

Christmas Spice: The fragrant wreath on the cover might well have been titled "The Spirit of Christmas Past" for it came as a gift a year ago from the lady who originated and executed it, Mrs. J. Glennon Schreiber. Everything on it except the ribbon and the foam-backing can be found in a well-equipped kitchen. Though it has hung in a brilliantly lighted living room all this time, it is even more beautiful now that the coloring is more muted. The fragrance diminishes but is still pleasantly noticeable from close-by.

The wreath is made of over a dozen herbs and spices arranged in patterns on a base of *dried bayleaves*. Starting at the ribbon and going to the left, there is a whole nutmeg with its attached *mace* below it and three coffee beans above it, then a small *chili pepper*. Next comes a short roll of *cinnamon bark* supporting a design of three *cardamon* seedpods, three dark *juniper berries* and *cloves* at either side. Farther along is a narrow, dark segment of a *vanilla* "bean," *star anise* (familiar in Ozark apple butter) and the flat seeds of *flax*. Other details of the pattern include *ginger* root, *coriander* seeds, *anise* seeds, *peppercorns*, and *cardamom* seeds.

PHOTO, COURTESY SHAW CAMERA SHOP

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Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Editor: EDGAR ANDERSON.

Published monthly except July and August by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $3.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden
Vol. LIII No. 10 Bulletin December 1965

WHY A BOTANICAL GARDEN

DAVID M. GATES, *Director*

A PLACE of beauty, an island of elegance, a storehouse of knowledge and learning of plants; this is a botanical garden. More than a greenhouse, more than a park, neither a forest, a prairie, nor a desert. A place to portray and preserve plants, to study and learn about the world's greatest consumer and converter of solar energy. A botanical garden has as its primary concern the living, chlorophyll-laden surfaces of the Earth, representing perhaps a million times the surface presented by rock, soil, and water.

Man's full understanding of the plant world is so far from realization that it seems like a vague vision to be ignored by a busy world intent upon self-strangulation and planetary probings. We build new ships to explore the seas, new observatories to search the stars, accelerators to probe the nucleus, computers as arithmetical aids, and rockets thrusting satellites into orbit. But do we understand how plants evolved, why the vast array of varieties, how man and his predecessors would not have grown without plants, nor how insects lions, and birds appeared? We search for life on other planets in order to find the very thing we wish to take for granted on our own abode. The evidence for organic evolution is being demolished as rapidly as man can plow, doze, pave, pollute, and otherwise scarify the surface of the Earth.

Henry Shaw, with vision and conviction, founded an institution known as the Missouri Botanical Garden, for the "science of Botany, Horticulture, and allied objects" and maintained "for the cultivation and propagation of plants, flowers, fruit and forest trees, and other productions of the vegetable Kingdom." During the last 106 years the Missouri Botanical Garden has made substantial contributions to the science of botany, has educated many of America's most distinguished taxonomists, has stimulated interest in plants among a vast public audience, and has given beauty and pleasure to innumerable millions who have trodden its paths. There has not been founded in the United States another institution of the same unique character as the Missouri Botanical Garden which combines display, research, and teaching in such a vital way.

Here in our herbarium cases we harbor 2 million specimens of dried plants, meticulously preserved and intimately labeled as to name, origin and collection date. These plants are mute testimony to the quality, beauty, and generic character of the "world we live in"; they guide us to understanding it before, during and after man's disruption of its surface. These collections, many made nearly 100 years ago, are irretrievable if destroyed by fire. Scientists from many lands travel to St. Louis in order to study the specimens within our herbarium cases. Due to the foresight of Henry Shaw and the insight of the distinguished scholars who during the last 100 years have been in residence at the Missouri Botanical Garden, many thousands of specimens per year are loaned to other institutions at home and abroad. These scholars were not sheltered, long haired, impractical men peering through microscopes and withdrawn from society. They were and are men of physical stamina and alert minds, of a fibre few are endowed with, possessed of intense curiosity to understand the most remote dimensions of the plant world. These men went west with the great explorations of America when St. Louis was the gateway on the frontier. They have spanned the globe from equator to pole and from Africa, New Guinea, Guatemala, and Brazil, from India, Antarctica, the Pacific Islands and wherever plant life grew. From these labors came one of the greatest collections of plants within the Americas.

A vast array of living plants, exotics from the far reaches of the Earth, which could not survive the winter winds and fluctuating climate of mid-America, are sheltered beneath glass and plastic walls containing the humid heat of the tropics or the dry hot air of the desert. Here within the Climatron and greenhouses grow some of the world's most remarkable living things. These plants are here for study, for popagation, and for enjoyment. The sheer beauty of their flowers is unsurpassed in the experience of man and the geometrical variety of their form unmatched by the physical world. Where else can one stand before such variety and elegance of form and color, such enormous testimony to the experience of evolution? Within the confines of these walls man can strive to understand the function and adaptation of plants.

A creative scientist stands on the shoulders of his predecessors and in this way the pyramid of knowledge is built. The record, as far as earlier investigators could set it down in writing, is contained in the books and journals of our library, five centuries of vivid, descriptive and philosophical writings by the greatest minds of man kindled by the challenge of plants. Here our staff and their contemporaries from many lands study and learn, stoking the inspirational fires of the human mind, in order to unravel the intricacies of plant evolution. No historian of American botany can complete a major study without having recourse to our library. The Missouri Botanical Garden is truly a major center for learning about plants and all that plants can do for mankind.

This heritage of minds, men, plants and books within this institution must continue to thrive and contribute to man's well being, a well being not predicated on paving or pollution but founded on a deep and thorough understanding of the natural world, a world of plants and animals. Toward this end the Missouri Botanical Garden will carry the banner for botany and crusade for the understanding and enjoyment of plants. The world needs a botanical garden more today than ever before in the history of mankind. The glamor of space, stars and galaxies must not shunt nor shadow our efforts to understand, utilize and enjoy the beauty of plants. Without such understanding man will become a degenerate species unable to cope with a poisoned planet, incapable of retrieving a comprehension of life, and frustrated in his attempt to locate new life elsewhere in the universe.

In the tradition and wisdom of Henry Shaw, the Missouri Botanical Garden must thrive and grow as an essential part of the modern world. In these pages you will learn during the months and years ahead of our efforts to do just that. We shall dedicate our efforts to this end and will ask for the collaboration of all who believe in the understanding of plants as an essential pathway to survival.

OUR NEW STAFF MEMBER, DEREK BURCH

ONE of the basic difficulties in running a botanical garden is to get botanists and horticulturists who have had training and experience in the peculiar mixture of activities carried on in such places. Dr. Derek G. Burch, who came here last September as Assistant Botanist, arrived with as many kinds of useful experience to his credit as any staff member in the history of this Botanical Garden. Though still in his thirties he has had technical training and practical experience in controlling plant diseases, has helped run an herbarium, has had the responsibility of answering the public's questions about weeds and poisonous plants, has operated a propagating greenhouse, has taught elementary botany, has operated a landscape gardening business, has been the "trouble-shooter" and general handyman for the Director of a big Botanical Garden, has raised orchids from seed by the latest improved methods.

The mere cataloguing of such activities since he left his boyhood home in England until he arrived at our gates would make him sound like a rolling stone. His history, unfortunately, is altogether too typical of the difficulties facing young men in post-war Britain when they set out to make their way in a changing world.

Dr. Burch came naturally by his deep-seated interest in plants. He grew up in outer London, near enough the Royal Botanic Garden at Kew that the family went there frequently, yet far enough from the city that they found interesting places to go camping together. His mother was the chief gardener of the family and had a little rock garden and grew small bulbs, though she would have been the first to insist that it was not really a collection. (It might be explained that when a modern Englishman tells you modestly that he "grows a few small bulbs" this is a masterpiece of

English understatement. It does *not* mean that he just buys a few snowdrops and crocuses and sticks them in the ground. One usually learns that for several decades he has been earnestly building up a collection of daintily beautiful plants, mostly a few inches high and coming from bulbs or corms as small as the end of your little finger, or smaller. To succeed, one has to learn the particular likes and dislikes of each kind before he loses it. Furthermore, for at least some of these rarities he must by a mixture of skill and good luck have extra bulbs to trade. A good collection requires bulbs that are virtually impossible to buy; you gradually make your way into this select brotherhood by succeeding with a few kinds that even experts find difficult. Some of these little gems are common things; many of them are part of the loot which British gardeners have obtained one way and another from all over the world—the mountains of Afghanistan and Turkey, the back-corners of North Africa, Spain, and Portugal, the southern Andes, and our own Northwest. Their very names are unknown to ordinary gardeners or botanists.)

With this kind of background it is not surprising that when Burch became of college age he decided to study Agricultural Botany and entered the University College of Wales, Aberystwyth (Abber-iss'-twith). Modern mass-production Agriculture was making rapid strides, particularly in the tropics; a young man with an interest in plants and good basic training might look forward to an interesting and profitable career if he could cope with the more or less unexplored problems that turn up in such operations.

It was a good choice. Decades before, the ecologist, Sir George Stapledon, had made this institution a center for understanding the peculiar problems of growing grass as turf. Eventually he and his associates demonstrated how the beautiful hill and mountain pasturelands of Wales could be made highly productive. The studies of Kentucky Bluegrass, begun here at the Garden thirty years ago and much in our national programs with golf and lawn and pasture grasses, stem from Sir George's insights. Furthermore, for a naturalist, few universities have a finer setting in which to spend one's college years. On gently sloping grounds, just nicely back from the sea, the University faces a long sweep of rocky coast with sandy bays. Close at hand are pleasant hills. In the blue distance are the Welsh mountains with their moorlands and alpine summits to explore.

Dr. Burch took his Bachelor's degree at Aberystwyth and immediately began intensive graduate work in Plant Pathology there with the idea of eventually finishing his doctor's degree at another university. He worked on "Ring Spot," a well known disease of cabbages which according to all the authorities attacked only mature plants. He advanced the understanding of this disease by demonstrating that the text books were wrong. The cabbage plants were infected when they were very young though it took careful microscopic study to find the growing fungi in their tissues. Not until the characteristic spots were produced on their leaves was there conspicuous evidence of the disease. These studies were evidence of his promise as a scientist, but they prevented him from getting a doctor's degree promptly. To demonstrate the details of the real life history of the fungus would require starting all over and demonstrating, step by step, precisely what happened. This would take much longer than he and his advisors had planned; and his scholarship time was running out.

At this point he had a commercial offer to study the diseases and pests of sugar cane for a company which was growing cane and producing sugar in the Dominican Republic. It was hard work but he loved it. He participated in bringing one of the insect pests under biological control through the use of a parasitic fly. "I worked with those flies so intensively," he says, "that I can still recognize them and even tell the sexes apart at 50 paces!" He cooperated with another sugar company which was carrying on similar work down in Venezuela. "I flew down there," he says, "with living cultures of *our* fly and brought back a stock of *their* fly to Santo Domingo."

He enjoyed the work and the life in Santo Domingo. He even learned to put up with the damp, oppressive heat, except that, like many red-haired people, he has a sensitive skin. Shaving every day was bad enough in England. In the Tropics it was torture, and in that climate there was the constant risk of fungal infection. Accordingly he again raised a beard. Sandy red, scrupulously groomed and most becoming, it now lends distinction to gatherings at Shaw's Garden whether formal or informal.

Though Dr. Burch continued to be fascinated by life in the Tropics, he was wise enough to realize that Santo Domingo was not the place for him to settle down permanently. (Only those who have been exposed to the experience can realize the exaggerated social tensions that develop when Europeans of several nationalities exist as a tightly knit enclave within a radically different culture.) Accordingly, he started off his scientific career anew in charge of the propagating greenhouse at the Fairchild Tropical Garden in southern Florida, a fine opportunity for a young man with an interest in tropical vegetation. As this interest continued to grow, it carried him in what might seem the wrong direction; he joined the staff of the Montreal Botanical Garden in Canada.

Burch went there to work under the dynamic Henry Teuscher, a European-trained horticulturist. It was he who developed a display vegetable garden which includes such unusual things as rat-tailed radishes, grown for their spicy seed pods. It is charming to look at, yet its display labels are so complete and so accurate that typed copies of the whole set have been used for reference material in University courses in Economic Botany. Teuscher has had a real effect on the entire city of Montreal as well as on its botanic garden. Much of the city is so closely built up that there is little opportunity to grow flowers. Teuscher developed window box gardening into a fine art; there is now a city-wide campaign every year to fill Montreal with bloom. It is so successful that Burch says in May he saw thousands upon thousands of window boxes come into flower—"the city just bloomed!"

Working as a "trouble-shooter" and general handyman directly under Teuscher was invaluable experience for Burch. He prepared accurate and complete lists of the Bromeliad and Aroid collections to facilitate exchanges with other institutions (which, of course, built up the Montreal collections even more); he made detailed technical descriptions of rare tropical orchids when they came into bloom for the first time; he translated the Garden's popular Bulletins, on such subjects as lawn care, into English out of the original French, so that they could be used by the many Montreal citizens who understand only a little French.

Everything was going forward famously when political conditions exploded in his face. There was rabid agitation to keep new arrivals from England out of municipal jobs in Montreal. Under this pressure it was impossible for Burch to renew his visa, and he was forced to return to Florida where the Fairchild Gardens created an emergency position for him. For a short time he was their "Horticulturist" in charge of such features as Palms, Aroids, Bromeliads, Cycads, Flowering Trees, and Ground Covers.

Then Burch met and married an American girl and settled down to the responsibilities of family life. As a result, he finally decided to get back into university work and finish his technical training. He became a candidate for the Ph.D. in Taxonomy at the University of Florida at Gainesville, concentrating eventually upon the classification of the Spotted Spurges which include those ingenious little weeds which have learned how to prosper in modern cities and fan out into mats from cracks in the sidewalk. He chose this training partly because of his growing interests in such problems, partly because a Ph.D. has become an almost indispensable "Union Card" in modern University life.

At Gainesville, Burch eked out his graduate student income in ways that gave him still further experience. He was a teaching assistant in Botany; he was a technical assistant to Dr. Yoneo Sagawa, an outstanding authority on laboratory culture of orchids. (Dr. Sagawa began his professional career as a graduate student of Dr. Gustav Melquist when the latter was a joint staff member of the Garden and the School of Botany at Washington University.) Dr. Burch also worked with weeds and poisonous plants, first as "Research Assistant" in the Herbarium, getting together precise information about weeds for Extension Service publications. Eventually he became "Extension Botanist," identifying weeds, wild-flowers, and cultivated plants which were sent in for identification, and answering all kinds of related questions by mail and over the telephone. Last August saw the completion of his graduate career. One day, last month, in referring to his Ph.D. he said with a quiet smile, "The ink was still wet on my diploma when I arrived at the Garden."

Like most members of the scientific staff, Dr. Burch will divide his time between the Garden and Washington

University, where he is an assistant professor in the Botany Department. This year he will teach the course in "Beginning Systematics," two lectures and two lab periods a week during the second semester. This will deal with the identification and classification of the flowering plants a student is most likely to meet.

At the Garden, Burch's role as Assistant Botanist is mainly to help Dr. Lewis in curating the Garden's tremendous collection of around two million specimens, chiefly of flowering plants and ferns. Virtually all the big herbaria in the world cooperate with each other in the collection, classification, storage, and study of these standardized samples of the world's flora. They are mounted on stiff, heavy paper of standard dimensions (roughly the shape and size of a newspaper page folded over once) with a small label giving the details about when and where and by whom they were collected. They are kept safe from insects and dust in tightly closed cabinets, sometimes of wood but usually now of steel. They form one of the world's most important "information retrieval systems." Their standardization and the world-wide cooperation between botanists, means that tens of thousands of them are in circulation at any one time, being lent for study, identified by experts, traded between institutions, bought, and sold. The world's flora is still very imperfectly known, and it is important that after new collections have been made they should be identified (more or less provisionally, if need be), and shared with scholars at other institutions. Because of Dr. Woodson's sudden death, two years ago, and for a variety of other reasons, Dr. Lewis on his arrival last year was faced with a dismayingly large backlog of undistributed (and imperfectly labeled) collections, largely in the state they had been left by their original collectors. With the assistance of his staff and student assistants he has made remarkable headway in a year, but there is much yet to be done. Getting these collections into useful circulation is presently Dr. Burch's most important function. He also answers questions over the telephone, identifies specimens which come in by mail from the general public and is deftly useful when students, staff, and visiting scholars work with the giant collection from day to day.

MRS. LESLIE GLEASON, who has been executive secretary of the FRIENDS OF THE GARDEN since early October, is a returning St. Louisan who has known the Garden since childhood. In her college years at Fontbonne and Washington University she sang with the Opera Workshop and the St. Louis Light Opera Guild.

After entering the business world as executive secretary and office manager she went into the field of public relations and was associated with *Time* Magazine, Lockheed Aircraft, and Jim Ameche Productions.

Mrs. Gleason is the daughter of Mrs. L. S. Robinson and the late Brig. General Earl H. Robinson. Before moving to the West Coast she was active in the Civic Music League and as a Red Cross Gray Lady at Barnes Hospital.

A TRIP WITH KENNETH PECK

NEXT April and May the Garden will cooperate in a springtime garden tour in England, France, Belgium and Holland. Mr. Kenneth Peck, Director of the Garden's Educational programs, will accompany the group which is being organized by LEONARD HAERTTER TRAVEL.

The group will leave St. Louis, April 27, arriving in Amsterdam, April 28. Three weeks later they will return from London to St. Louis on May 18. They will visit public and private gardens and some outstanding nurserymen in and near Amsterdam, Brussels, Paris and London. Mr. Peck's horticultural classes and tours of the Climatron and the Garden have won him many friends in St. Louis. Trained as a botanist, he is a keen gardener who flowers such things as alpine Gentians successfully in his rock garden in Webster Groves. He will organize informal talks and discussions that will add to the permanent value of the trip.

For all further details call LEONARD HAERTTER TRAVEL at PA 1-6200 or write 5 Forsythe Walk, St. Louis, Missouri 63105.

The accompanying view of the tulip fields near Haarlem is a timely reminder that this Garden Tour would make an appropriate Christmas gift for someone interested in gardens and gardening.

TULIP FIELDS AS CHRISTMAS GIFTS? SEE ABOVE.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnaean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities are from the period immediately following the turn of the century. The Climatron, opened in 1960, is the world's first geodesic dome climate-controlled greenhouse and contains the Garden's main tropical collections.

The Garden—70 acres—is open every day of the year except Christmas and New Year's fom 9:00 A. M. until sundown; most of the greenhouses close at 5:00 P. M. On Sundays the Climatron stays open until 7:00 P. M., as well as Memorial Day, Independence Day, Labor Day and Thanksgiving Day. Tower Grove House is open daily from 9:00 A. M. to 5:00 P. M. (April through November); 10:00 A. M. to 4:00 P. M. (December through March). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature classes are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The scientific activities of the Garden are integrated with those of Washington University.

In 1926 an Arboretum—1600 acres—was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors from April 1st to May 15th.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden's main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is sometimes open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden." Information may be obtained from the Main Gate or by mail or phone.

Phone TOwnsend 5-0440